THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIII. No. 1615.] LONDON, APRIL 24, 1894. [46TH YEAR. PRICE 6d.

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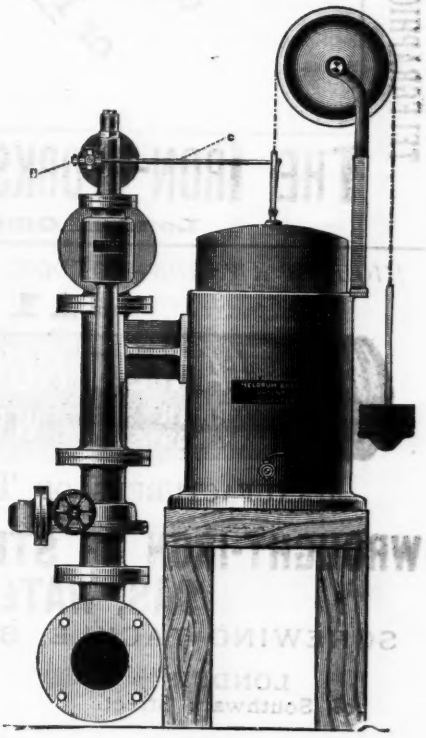

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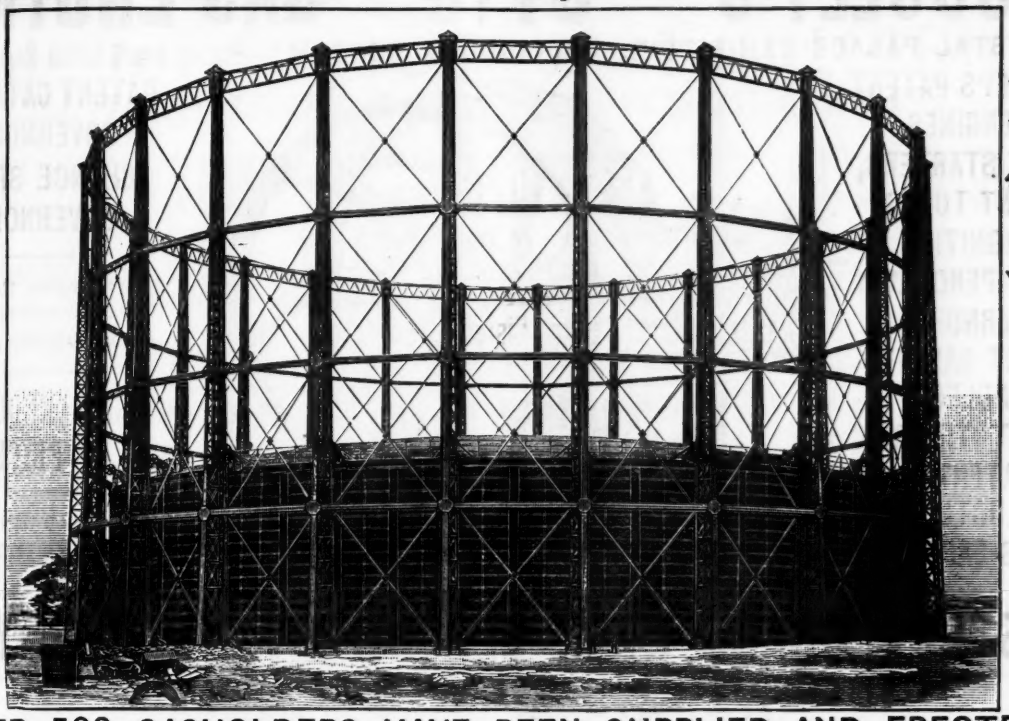

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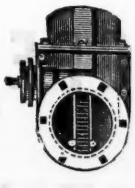

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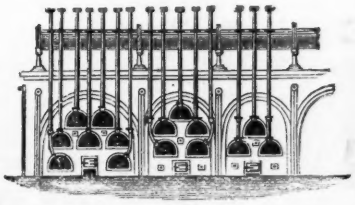

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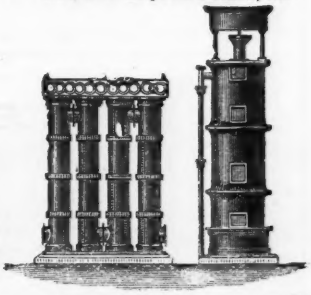

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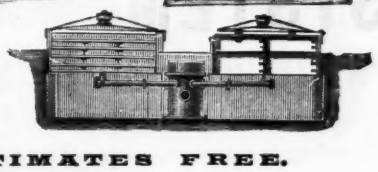

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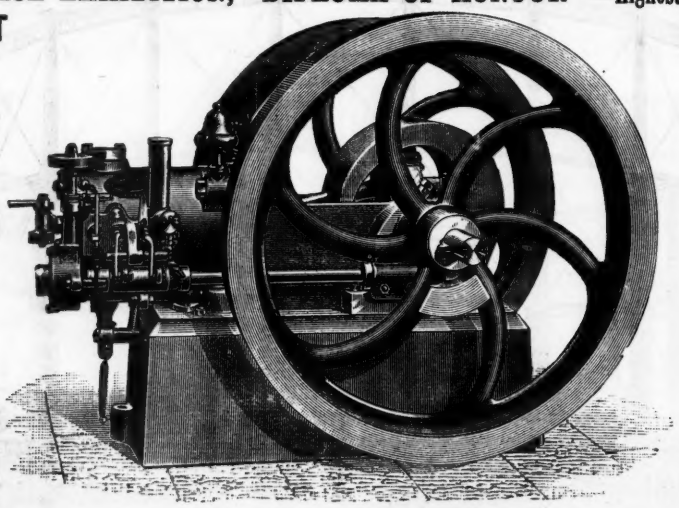

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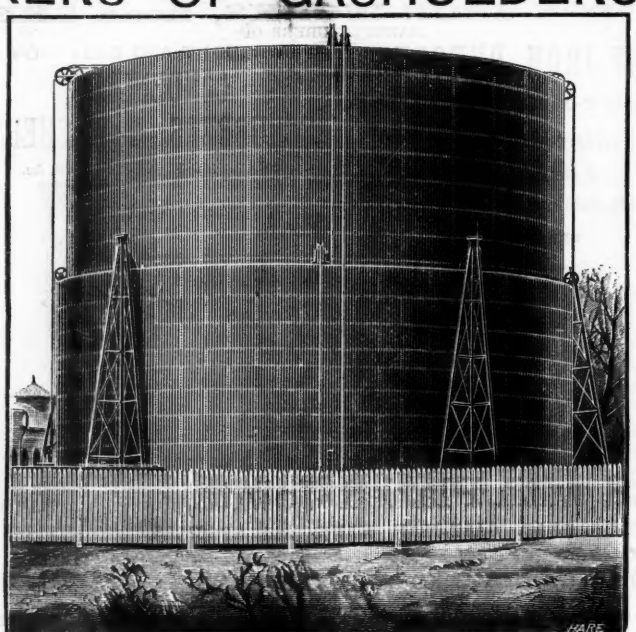

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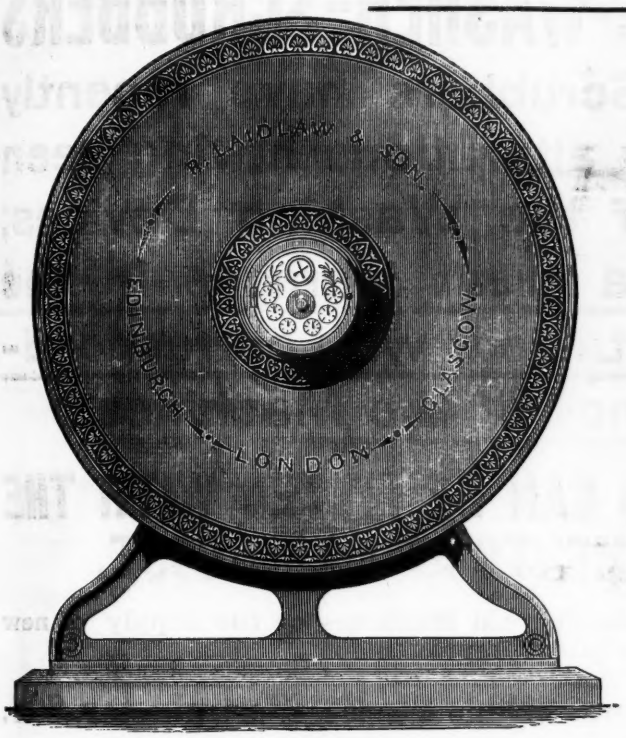

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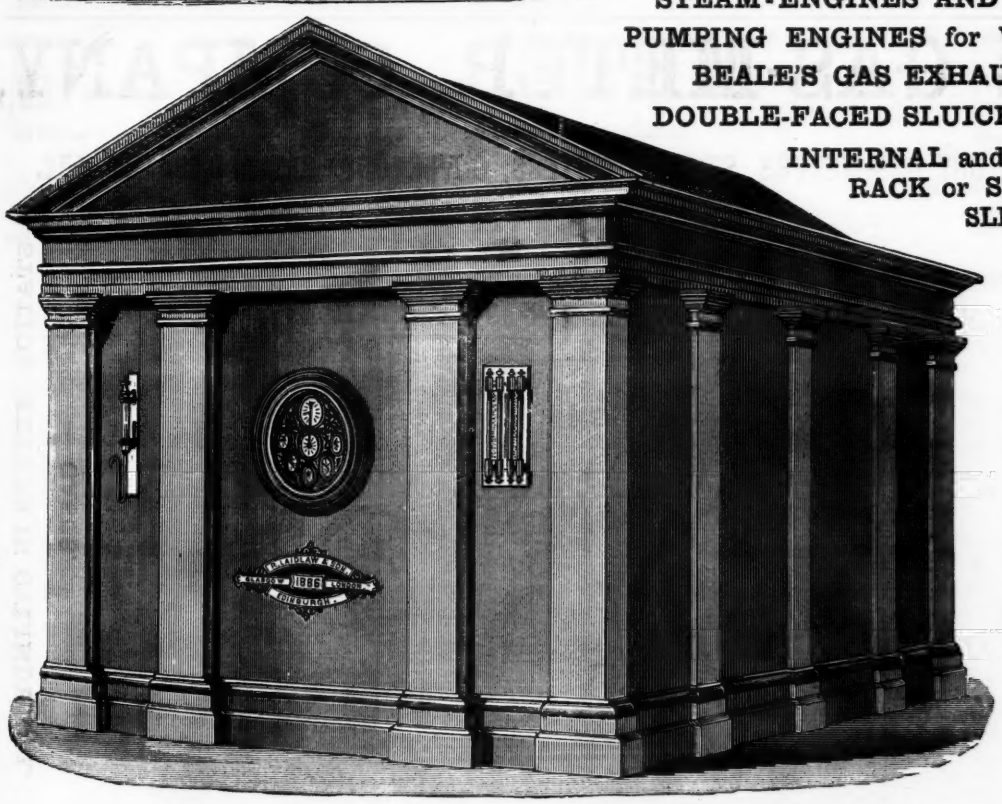

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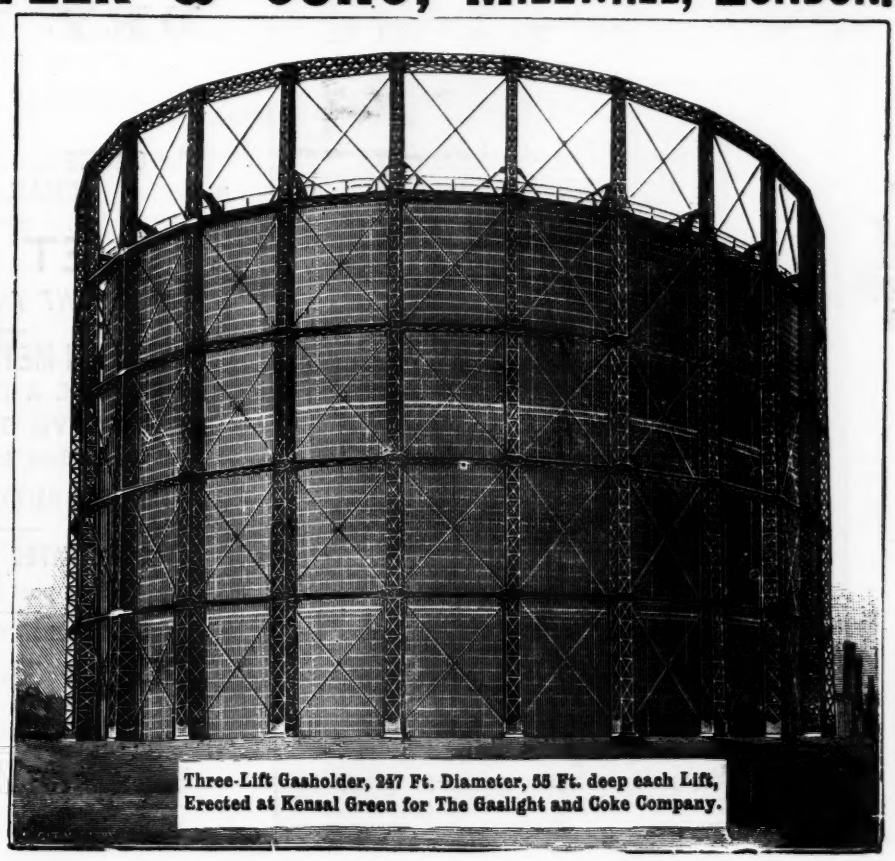

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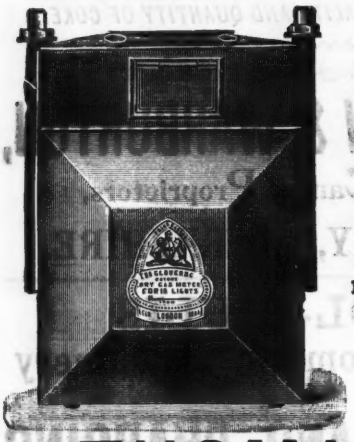

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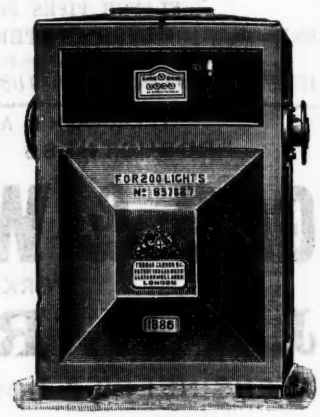

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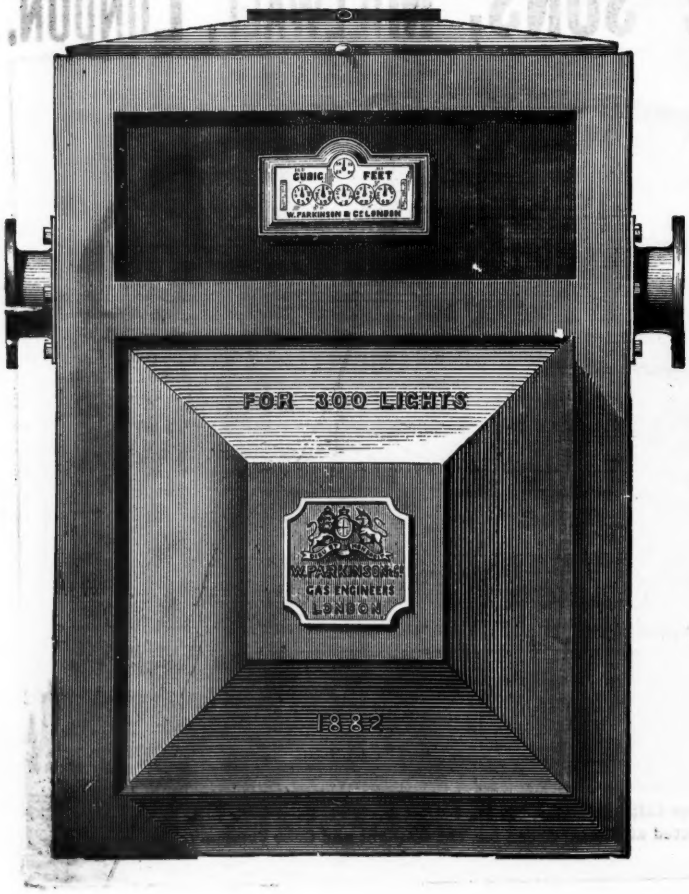

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 24, 1894.

The Carbonizing Returns of the London Gas Companies—An Explanation.

AN esteemed correspondent has favoured us with a correction of the table which was published in our last week's editorial columns, giving the carbonizing results of the past year's working of the three Metropolitan Gas Companies. He is good enough to inform us that the figures appearing in this table of ours are misleading and very fallacious; and he supplies us with another table, showing the effect of dealing with the same data in a different, and, he considers, a better manner. As we have no other object in publishing matter of this kind besides the promulgation of accurate statistical information, we gladly give, on the next page of the JOURNAL, our correspondent's table in its entirety.

But the differences thus brought out cannot be allowed to pass without explanation. It will be noticed that the corrections of our table are confined to the proportional weights and quantities of the residuals, and relate to the disturbing effect of the substitution of oil and petroleum spirit for cannel. Whoever has had to deal statistically with the accounts of the London Gas Companies during the last few years, must have noticed the appearance and the growth of this disturbing element; and he would also be confronted with the lack of uniformity displayed by the Companies in their returns of coke and breeze. In consequence of these differences—amounting in the case of the coke to an actual discrepancy in the estimation of the weight of the chaldron—it has not been possible to deduce any general comparative ratios from the figures given in the official accounts without appending to such statements explanatory notes. In the case in point, we admit that our table gave the rates of residual production upon the gross amounts of material carbonized, which, as a matter of fact, are in every case made up of two components—the coal, and a proportion of oil or spirit reckoned at an equivalent in coal. We are now told that, in strict fairness, the rates of production of coke, tar, and ammoniacal liquor ought only to be computed upon the coal carbonized; and the new table shows the effect of this alteration of the basis of calculation.

It will be conceded that, in printing this second table as prominently as the first, and putting it in a similar place, we are manifesting as plainly as possible a desire to treat this difficult question fairly. For it is a difficult question; and the trouble arises in connection with the determination of the proper allowances to be made for all the factors that go to the preparation of a strictly corrected comparative carbonizing statement. For example, what allowance should be made for the fact that, whereas The Gaslight and Coke Company are large manufacturers of carburetted water gas, both the other Companies carburet with petroleum spirit? This consideration, if fully treated as a salient point in regard to the different systems of gas making, would affect the proportionate cost of labour, the make of tar taken at per ton of coal carbonized, and several other data. The truth of the matter is that it is practically impossible to attain absolute accuracy in the adjustment of gas manufacturing statistics to the originating facts; and this is why, in commenting upon our own tables last week, we laid particular stress upon the necessity of bearing in mind the limitations of such statements. Then, with regard to the conversion of weights into measures of coke, we do not accept responsibility for the discrepancy of half-a-hundredweight between the estimates of the Companies. The Gaslight and Coke and the Commercial Companies have adopted one figure; the South Metropolitan Company adhere to another. We cannot say which is the correct valuation, and have simply followed the published accounts. Now that the Commercial Company have abandoned measuring their coke, it will be possible to drop the old fashion of stating the coke returns in terms of measurement, and give them in terms of weight. Lastly, as to the statement of the yield of ammoniacal liquor upon the uniform basis of gallons of 10-oz. strength, we have never done this; but, if it is thought to be an advantage, and the facilities for making the correction are afforded, this course can be followed in future. We have now traversed all the points brought into prominence by the second table, and can only hope that those of our readers who took note of the first will give equal attention to this explanatory statement. If there yet remains anything obscure in connection with these statistics, we shall be pleased to return to the subject at any time.

The Trade in Gas-Stoves.

THE temperately-worded letter of Dr. Pullar, on the vexed question of the policy to be followed by Gas Companies in regard to the popularization of gas cooking and heating apparatus, which will be found in our "Correspondence" column, reopens a matter that has never been satisfactorily discussed and settled upon a rational basis. The author, of course, deals with his subject from his own personal standpoint; but if he did not happen to be particularly

TABLE *of the Residuals made per Ton by the Metropolitan Gas Companies in the Year* 1893.

Name of Company.	Coke Made.			Tar Made.		Ammoniacal Liquor Made.		
	Per Ton of Coal and Oil, JOURNAL Table.	Per Ton of Coal.	Per Ton of Coal.	Per Ton of Coal and Oil, JOURNAL Table.	Per Ton of Coal.	Per Ton of Coal and Oil, JOURNAL Table.	Per Ton of Coal.	Per Ton of Coal.
	Bushels.	Bushels.	Cwt.	Gallons.	Gallons.	Gallons.‡	Gallons.‡	Gallons of 10-oz.
CHARTERED	*44·78	*46·72	12·33	9·88	10·31	28·97	30·22	28·41
COMMERCIAL	*45·03	*46·11	12·16	9·91	10·15	36·12	36·98	29·59
SOUTH METROPOLITAN. .	†49·08	*46·96	12·39	9·64	9·73	33·84	34·17	27·34
Average . . .	45·88	46·74	12·33	9·83	10·15	30·73	31·75	28·22

* Estimated at 9¾ cwt. to the chaldron. † Estimated at 9 cwt. to the chaldron (the South Metropolitan accounts say 1 cwt. = about 4 bushels).
‡ Actual quantity, per accounts.

interested in the prospects of a certain description of gas heating-stove, we should not have had the advantage of his criticism of the general practice of Gas Companies in this regard. And there is ample experience to show that, if left alone, the Companies, like other well-to-do business people, are liable to fall into easy business habits not always defensible on their merits. It is not to be denied that, by adopting the system of lending gas-stoves on hire, the manufacturers of gas have aided greatly in extending the use of gas for cooking and heating. Neither stove manufacturers nor ironmongers would have done as much in any way, either for gas or for the stove trade, as the Gas Companies and the Gas Committees of Corporations have done in this way. But the system is not devoid of the defects of its qualities. The ironmongery trade has left the gas-stove to the Gas Companies. These articles are no longer stocked by shopkeepers, or even by the co-operative stores; so that, to all intents and purposes, there is no open market for them. The result of this is what was foreseen when the hiring system was first started. Except within narrow limits, the trade in gas-stoves has become fossilized. The object of the average gas manager who has to do with the hiring-out of gas-stoves is to restrict his stock patterns to the narrowest range. If he does not disbelieve in the possibility of improvement in these articles, he is at any rate averse to letting his people get a sight of any new-fashioned fancy article that will have the effect of causing a number of the old stoves to be returned upon his hands. Thus progress is discouraged, and the makers of the stoves that have the run of the different hiring-out establishments care for little else than to cut down prime costs and emulate one another in the production of a featureless article. In heating-stoves, the conditions of trade are somewhat different, owing to the circumstance that these conveniences of town life are rarely hired. It is the subject of complaint, however, that prices are rendered unremunerative by the action of gas manufacturers in relinquishing the ordinary retailers' profit; while progress is discountenanced by the fact that, whether he sells or lends out the stove, the gas manager does not want anything too new or strange in the show-room. The usual seasonable brightening-up on the part of the accredited dealers is expected. To put an extra bit of copper here or there, or a tile of some fearful and wonderful colour somewhere else, is the bounden duty of the stove maker what time he sends out his circulars announcing the new autumn patterns. But let anybody who has been rash enough to venture off the beaten track call for orders at a gas-works, and see what his reception will be! Competition in trade is the only source of progress; and since this has been interfered with, and an artificial state of things created in the case of the gas-stove industry, it is not surprising that the condition of the industry is not satisfactory to all concerned.

The Lighting of Common Stairs.

THERE was an interesting discussion before the Select Committee appointed to consider the clause in the General Powers Bill of the London County Council on the subject of the lighting of common stairs. The circumstance of a London Local Authority having been led to seek statutory powers in respect of the lighting of common stairs, is a significant proof of the nature of the change that has lately been wrought in Metropolitan house accommodation. Twenty years ago, there was hardly such a thing as a "common stair," in the ordinary Scotch meaning of the term, in the length and breadth of London. Now once more "Scotland has conquered England;" and the existence of the "common stair" within the Metropolitan area is a fact to be dealt with by the authorities. Yet the institution can hardly be said to have as yet become naturalized in London; and so little is the character of the common stair understood, that it is a disputed point, as between the owners and occupiers of premises provided with this style of approach and the Local Authority, as to whether they are better lighted or left in darkness all night long. In their Bill, the London County Council proposed that the owner of any building designed to be let out in flats or tenements, and consequently possessing a staircase or passage used in common by the occupants, should be bound to light it from sunset to sunrise to the satisfaction of the parish lighting authority, who might prescribe the amount and position of the light. The obligation to light the staircase could, however, be avoided by placing an iron gate at the entrance, and keeping it always locked at night. The County Council, in short, wished to treat these passages and staircases as part of the public street. The proposal met with a considerable amount of opposition from owners and occupiers of the description of house property to which the Bill would apply; but, in the end, the Committee decided to pass so much of the preamble of the measure as related to the lighting of public staircases, subject to the provisions that the Vestries concerned should be allowed to order the lighting or not at discretion, and should bear half of the expense in cases where lighting was decided to be necessary. This decision appears to meet the justice of the proposal. There can be no doubt as to the expediency of lighting all places of public resort, whether stairways or passages; but at the same time, a hard-and-fast law on the subject might be difficult to work, and would probably create trouble in respect of debateable cases.

The Rating of Machinery Bill.

THAT "hardy annual," the Rating of Machinery Bill, has cropped up again in the House of Commons. It would scarcely be worth mentioning here but for the circumstance that, mainly owing, we believe, to the representations of the Executive of the Water Companies' Association, the objectionable clause excluding gas and water undertakings from the scope of the measure has this year disappeared. The principal clause of the Bill does not seem to have changed in any essential respect. It still proposes that, in estimating the gross rateable value of any hereditament occupied for trade, business, or manufacturing purposes, increased value arising from moveable machines, tools, or appliances shall be excluded; provided that the gross annual value of such hereditaments shall be estimated at not less than that at which they might reasonably be expected to let to a yearly tenant for the purpose for which it is used void of any tenants' machinery. It further provides that the terms "machinery, tools, and appliances," as employed in the Bill, shall not apply to apparatus for producing or transmitting first motive power, "or for heating or lighting the "said hereditament." After all, it is impossible to get up more than a languid academic interest in these parlia-

mentary schemes, produced but to be sacrificed to the exigencies of a strained political situation, and fulfilling their only purpose when they have contributed to swell the printing bill of the House to its normal figure.

The May Meeting of the Incorporated Institution of Gas Engineers.

As will be seen from the announcement made in another column, the Incorporated Institution of Gas Engineers will meet on the 9th and 10th of next month, under the presidency of Mr. Alfred Colson, of Leicester, at the Institution of Civil Engineers, Great George Street. We understand that at least nine papers will be read before the Institution—several of these communications dealing with gas engineering subjects of much actual interest and importance; while the President's address can hardly fail to engage the attention of the gas engineering profession at large. The meeting is to wind up with a visit to the works of the Reading Gas Company, which are known to be a model of what can be done in regard to the application of mechanical power and labour-saving appliances in gas manufacturing stations of moderate size. The list of papers and authors has not yet been issued; but it must appear next week. The annual dinner of the Institution will be held at the Holborn Restaurant on the evening of the first day of the meeting. There is not much to be said in advance respecting the prospects of the gathering, which ought to be attended by every member of the Institution who can possibly find his way to London at this season of the year, if only to compensate for the unavoidable desertion of the October meeting by many of those who were solicitous for further trial of the experiment of two sessions during the year.

District Association Meetings.

Two District Associations of Gas Managers held meetings last week—in both cases with much success, so far as the attendance was concerned. The South-West managers met at Salisbury on Tuesday, under the presidency of Mr. N. H. Humphrys, F.C.S., whose Inaugural Address will be found elsewhere to-day. At the same meeting, Mr. D. Irving, of Bristol, submitted drawings and a description of a governor-house and its connections at the Stapleton Road station of the Bristol Gas Company; Mr. Alfred Thomas, of Cowes, contributed a brief memorandum on "Retorts and Chimneys;" and Mr. J. G. Gough, of Calne, read a really useful paper upon "The "Prepayment System." This last production would alone have been quite sufficient to redeem the meeting from the accusation of barrenness. At Bury St. Edmunds, on the following day, the Eastern Counties gas managers assembled under the presidency of Mr. W. J. Carpenter, of Yarmouth, who read his Inaugural Address, and started a discussion of a conversational character upon the subjects of differential prices for gas and meter-rents. The day was pleasantly rounded off with a visit to the ruins of the Abbey and to the Botanical Gardens; terminating with a dinner.

Gas Prices and Consumers' Bills.

THROUGH the kindness of Mr. F. E. Barker, a member of the Board, we have received a copy of a report of the Massachusetts State Board of Gas and Electric Light Commissioners, upon an investigation they have recently been conducting into the relationship between the price of gas and consumers' bills. The question was brought in due form before the Senate and House of Representatives, who made an order in the matter on Feb. 28; while the reply of the Board bears the date of March 26. Thus dilatoriness in business cannot on this occasion be charged against the Commissioners. The whole affair, however, is mainly of interest as illustrating the way in which when there is a government organization of this particular kind, work is found for it to do. It appears that, whereas the Board had ordered the price of gas in Boston and the neighbourhood to be reduced from $1·30 to $1 per 1000 cubic feet, it was alleged before the Legislature that, so far from this enforced reduction having benefited the consumers, the amount charged on the gas bills throughout the district "had "increased instead of diminished by reason of the increase "of pressure without any increase of illuminating power." We have here a revival of a popular superstition that certainly did not take its rise in the United States. There being in existence a Board of Gas Commissioners, the State Legislature seem to have taken the allegation against the Companies seriously, and ordered the Board to examine into, and report upon, the question generaly, without supplying them with any definite statement of injurious dealing such as might have been expected to form the basis of complaint. The result is a strong condemnation of the practice of entertaining vague assertions of the kind. Being without direction to particular instances of overcharge, the Board had to institute an inspection of the sales ledgers of the seven implicated Gas Companies; picking out at random several hundred consumers' names, and comparing their accounts for corresponding periods of *ante* and *post* reduction years. The comparison showed that the various representative consumers had received the full benefit of the reduced charges. It is also proved that there has been no diminution of the illuminating power of the gas supplied at the lower rate; that the pressures have remained the same; and that the consumers' meters are generally accurate. It is to be remarked that the State Meter Inspector finds that the meters showing the largest errors belong to Companies who have had "in "their gas for a series of years more than the average "amount of ammonia." When it is considered that the Companies included in this return have been visited by what they regard as a high-handed deprivation of something like 25 per cent. of their gas rental, it may be easily understood that—human nature being what it is—the popular suspicion that they would resort to reprisals was not altogether unaccountable. Indeed, the complaint of such measures as having been actually undertaken by the Companies is to be regarded as in a sense an admission of the rough justice of this course of action; for when a man accuses another of cheating him in a particular way over a bargain, it is a pretty clear indication that the victim is not blind to the possibility that he might have done likewise if the parts had been reversed. The fact of the Boston Gas Companies having come triumphantly out of their trial in this instance is, therefore, to be put to their credit; although we doubt if their enemies will so acknowledge the result.

Obstruction of Light by Globes.—According to some investigations made by Mr. G. D. Shepardson, the results of which have been summarized in the *American Gaslight Journal*, the globes used with electric arc lamps are very serious obstructors of light. Measurements of the mean hemispherical illuminating power of the bare arc gave about 450 candles; and the quantity of light absorbed by the various globes employed averaged 38 per cent. with clear glass, 52 per cent. with ground glass, and 69 per cent. with opal glass.

The Forthcoming Meeting of the Incorporated Institution of Gas Engineers is to be held on the 9th and 10th prox., at the rooms of the Institution of Civil Engineers, Great George Street, Westminster, when the arrangements already made promise two full days' work. In addition to the Inaugural Address of the President (Mr. Alfred Colson, M.Inst.C.E.), there are already nine papers set down for reading and discussion. The annual dinner of the Institution will be held at the Holborn Restaurant on the evening of Wednesday; and on Friday a visit is to be paid to the Reading Gas-Works, followed by a river excursion to Maidenhead.

The Proposed Negotiations of the London County Council with the Water Companies.—The Water Committee of the London County Council have drawn up a report, to be presented at the meeting of the Council to-day, stating that all the Metropolitan Water Companies have now replied to the Committee's letter with regard to negotiations for the purchase of their several undertakings. The Chelsea Company are averse to a transfer, but will give "their most careful consideration" to any definite proposal the Council may think fit to make. The Directors of the Kent Company "deem it premature" to enter upon negotiations for the sale of the Company's undertaking by agreement, until the Council or some authority has been empowered to make and carry such agreements into effect, and until the questions relating to the subsequent administration of the water supply in the Company's large extra-Metropolitan area have also been settled. The Directors of the Lambeth Company state that they have no power to enter into a binding contract for the sale of their undertaking; and accordingly they consider it undesirable and inexpedient to enter into negotiations for the transfer thereof. From the Directors of the New River Company the reply given is that, while they are unwilling to sell, they will carefully consider any communication the Council may desire to make; but they cannot accept the conditions laid down in the resolution of the Council as the basis of negotiation. The reply from the West Middlesex Company is similar to that of the Chelsea Company. The answers given by the Directors of the Grand Junction, the East London, and the Southwark and Vauxhall Companies have already appeared in our columns. Having all the replies now before them, the Committee are considering what further steps should be taken.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 770.)

THE week just closed has, like its predecessor, been a period of extreme quietude in the Stock Markets. Some markets have receded, and then recovered again. But, as a general rule, prices are down; and the general tendency was very dull. There has not occurred any noteworthy incident as the chief cause of depression; and it simply seems to proceed from public abstinence from coming in and buying. The high-priced investment stocks were, however, well supported; and, as a class, they form an exception to the general slackness. Towards the close also there was a recovery in Americans; and there was some dealing in miscellaneous undertakings, prompted by speculation as to the fate of the Budget proposals. Money is superabundant; and loans at even less than 1 per cent. have been spoken of. Business in the Gas Market has again been decidedly below the average figure in point of activity; and it exhibits no particular feature beyond a continuation of the demand for the best and most secure issues. The result is to produce a further rise in the quotations of the debenture stocks of the Metropolitan Companies. Gaslight "A" has been going rather heavily again. Business in it was quiet; and the price fell away to a closing mark of 230 "special," with a reduction of 2 in the quotation. On the other hand, all the secured issues were brisk and firm, commanding good figures; and the 4½ per cent. debenture stock is 2 higher. All South Metropolitan issues changed hands at good prices; and the debenture stock, in sympathy with the ruling tendency, advanced in value. Commercials were quiet and featureless. There was more activity among the Suburbans and Provincials, and general firmness; while Bristol has pushed up 1 higher. Among Continental undertakings, both Union and European were strong; but there was a slight disposition to realize the recent jump in Imperial. Of the rest, Bombay has recovered fractionally, in view of the maintenance of the last rate of dividend; but Oriental has receded, owing to a large number of shares having been brought to market by executors. Buenos Ayres debentures are better. Water stock was hardly touched all the week; but prices are pretty strong.

The daily operations were: The Gas Market was quiet on the opening day; but prices in general were steady. Buenos Ayres debentures rose 1; but Oriental fell ¼. Tuesday was somewhat inactive; but quotations were much better—Gaslight 4½ per cent. debenture advancing 2; and South Metropolitan debenture, 1½. East London Water gained 1. Wednesday was rather busier; and prices were good generally, except in Gaslight "A." Chelsea Water rose 1. Transactions on Thursday presented no feature; and the only movement was an advance of ¼ in Bombays. Friday was slack, and prices, except for South Metropolitans, were poorer; but Bristol improved 1. Saturday was very quiet and dull; and Gaslight "A" fell 2.

ELECTRIC LIGHTING MEMORANDA.

The Fortunes of the City of London Electric Lighting Company—Cooking by Electricity—The Lighting of Folkestone.

THE City of London Electric Lighting Company are by all accounts experiencing quite a fair share of the troubles, hindrances, and annoyances incidental to the building up of a central station lighting connection in a densely-populated district. They have had a work of enormous difficulty to perform in laying their mains; and their operations in this respect have drawn down upon them the objurgations of the mercantile community for street and pavement surfaces rendered impassible for in some cases protracted periods. Yet the Company have pushed on until now they can show a list of 406 streets, lanes, and courts in which they are ready to supply current. An electrical contemporary states that this progress has not been fast enough for prospective consumers in some districts, who were prevailed upon to have their premises wired months ago, in the expectation of being speedily connected to the mains, and have been grievously disappointed. In consequence of this delay, one case is mentioned of a shopkeeper having torn down the electric fittings and adopted Welsbach gas-burners. This behaviour is hard upon the Electric Lighting Company; but it may be doubted whether any display of main-laying energy upon their part would check the increasing popularity of improved gaslighting. In another respect the City of London Company have been unfortunate—an action for damages to property adjacent to their generating station in Blackfriars, caused by vibration set up by their steam plant, having gone against them last week in Mr. Justice Kekewich's Court. Few central station companies in London have escaped attacks of this kind; and in most cases the complainants have been more or less successful.

According to an "interview" described in the *Pall Mall Gazette* of the 16th inst., the London Electric Supply Corporation, in conjunction with the Crompton firm, are trying what is to be done in the way of hiring out electrical cooking and heating appliances. It appears that there is a show-room for these articles in Ebury Street, where the newspaper reporter was introduced to, and was duly impressed by, a shining stock of "delightfully clean-looking pots and pans and ovens," as to which it may be observed to be the fashion of such things to look clean when brand-new. Of course, Mr. Crompton was able to make out a good case for cooking by electricity. It transpired, however, that an electrical oven only works because it is a tightly-closed box; and the reporter was persuaded to note the superiority of this feature in comparison with the freely-ventilated gas-oven or roaster. For this reason, he was assured that it is impossible to cook different articles at the same time in such a roasting chamber as a gas kitchener provides, "as one taints the other." Anyone slightly acquainted with the principles of cooking would have inferred from the facts that the "boot was on the other leg;" but it is sufficient for a reporter to retail what he is told. He cannot be expected to have more knowledge of things in general than one of Her Majesty's Judges. Mr. Crompton made up a plausible story designed to deprive gas-cookers of their popularity; but he rather overdid it when in one breath he told his innocent auditor that the draught through a gas-oven tends to dry the outside of the meat, and in the next that the products of the combustion of gas injure the meat. Surely, a chamber must either be open or shut, and cannot present the inconveniences of both states at the same time. Mr. Crompton made some amends for these injurious reflections upon gas cooking apparatus by admitting that they do their work "about 25 per cent." cheaper than the electrical appliances; of course claiming that the difference amounts to nothing when it is considered how much "cleaner, nicer, better, and more convenient," are the latter. We should like to see an electrical oven after a year's use at the hands of the average "plain cook." Even Mr. Crompton, however, gives up electricity for boiling water in quantities greater than the contents of a small tea-kettle. It is the boiling, he says, that hampers the development of this way of using electricity; and with this admission we may well rest content.

A scheme is afoot for committing the ratepayers of Folkestone to a central station electric lighting scheme involving a capital expenditure of £35,000 at least, and how much more nobody knows. Fortunately for the ratepayers, one of their representatives on the Town Council—Mr. Daniel Baker—has a turn for statistics and a happy knack of putting data into understandable form. He has, moreover, some knowledge of the respective capabilities and cost of gas and electric lighting; and he is a regular and intelligent reader of the JOURNAL and the electrical periodicals. Consequently, Mr. Baker has been able to formulate a striking criticism of the Folkestone electric lighting scheme in the form of a table which appears in a local newspaper dated the 12th inst. In this statement, Mr. Baker has taken a "wrinkle" from the Editor of the *Electrician*, and casts his quantities into the shape of lines drawn to a scale of magnitude, after the pattern shown in the article reproduced from our electrical contemporary in the JOURNAL for Feb. 13 (p. 284). In this way he exhibits the preposterous character of the scheme for weighing down Folkestone, with a population of about 24,000, with a capital burden of £35,000 for electric lighting. In order to make this venture pay, it is shown that the sale of current in the town has been estimated to attain twelve times the average actual sales per head of the population in a number of cities and towns where central stations have been established for years. Finally, Mr. Baker makes out that, at local prices, after all was done, the cost of incandescent electric lighting would be *fifteen times* that of incandescent gas lighting. Yet, notwithstanding his knowledge of these facts, Mr. Baker is so far from being a disbeliever in electric lighting when properly done, and provided in the right place, purely as a luxury, that he has a scheme of his own for supplying it to a select part of the town—apparently after the plan favoured by Herr von Oechelhaeuser. When it comes to a question of comparing gas with electric lighting upon the ground of economy, however, Mr. Baker declares in the local newspaper that he is "so impressed by the new incandescent gas [burner]," that he has abandoned the intention of exclusively lighting with electricity the living and bed rooms of some high-class houses now being erected by him, and intends putting gas-pipes into every room. It appears, from all this, that Mr. Councillor Baker, of Folkestone, is eminently a gentleman who is "in the movement" of his epoch. At any rate, it is very rare to find a critic of artificial lighting, even when a professed expert, manifesting so close a grip of the conditions of the service.

Waverley Association of Gas Managers.—The 66th half-yearly meeting of this Association was held at Hawick on the 12th inst.—Mr. G. Taylor, of Jedburgh, presiding. As customary, the business consisted merely of a conversational discussion on various subjects of current interest to gas managers; and at its close the members visited the Hawick Gas-Works, under the guidance of the Manager (Mr. J. Smith). Mr. D. Vass, of Portobello, was elected President, and Mr. J. D. Smith, of Selkirk, Secretary and Treasurer. Later in the day, there was the usual dinner, at which Mr. Vass presided; and Mr. Taylor was presented with the gold medal of the Association on relinquishing the presidency. The next meeting is to be held at Portobello.

NEW LIGHT UPON OLD DIFFICULTIES.

THERE is an impression in the public mind, which contemporary developments of social and industrial politics tend to deepen and widen, that the practical concerns of modern life are more strongly affected by the abstract ideas prevailing among the thinkers of the time than has hitherto been suspected. On every side we find the causation of most concrete and practical issues directly referred to principles which might almost be called transcendental; as when the promulgation of social democratic ideas among certain men leads up to a strike of gas workers, or when the settlement of the hours of labour in the engineering trades is determined by purely social and humanitarian considerations. It follows from such reflections as these, which might be largely added to if it were necessary to prove the case, that it behoves all those who are desirous of "keeping up with the procession" of modern thinkers and workers-out of industrial and social problems, to avail themselves of every means within their reach of forming opinions upon the best and latest models. Just as the factory owner cannot afford to keep old-fashioned and inefficient plant and machinery in his works, while his neighbours and rivals adopt newer and more productive arrangements, so likewise is it at his peril that he allows his mind to sink into a groove, and shuts his sympathies to the wider thoughts of the men who are working out the problems of social existence around him. Ideas are not exactly the motive power of humanity; it is the emotions that play this part in social economy. But emotions are called into action by ideas; and it is one of the most remarkable characteristics of the age that it has witnessed the apprehension and spread of ideas among those orders of the community which have hitherto been impervious to all but the narrowest of human concerns.

We see now-a-days even the poorest of the people moved by ideas of most abstract nature, and of origin far removed from everything of which they can have actual experience. Indeed, those who have been instrumental in preaching the new gospels of Socialism, Trades Unionism, and even of Anarchy, have made it a taunt to the educated and employer classes of the community that they have no ideas comparable with those that have been found so captivating among the workman class. "All you can do," they urge with scorn, "is to stick to what you have got; you cannot explain how you have got it, or why you should retain it." And it must be conceded that the reproach is in a great measure just. This condition of things in regard to the distribution of ideas is a public danger, and should be altered as speedily as may be. The employing class of the community have no taste or need for attending mass meetings, or the smaller gatherings at street corners and in empty railway arches on Sunday afternoons, where the seeds of socialistic ideas are sown. But they can read helpful books written by thinkers who have set themselves the task of bringing the study of industrial and social economy up to date, and so equip themselves with knowledge, which is a better defence against the offensive part of Socialism than the irrational hatred and contempt of "agitators" and their dupes, which constitutes the sole refuge of many well-meaning people.

Some time ago we brought under our readers' notice the works of Lord Farrer and the Duke of Argyll in connection with the ever-present problems of industrial and social life. The articles in which the views and teaching of these contributors to the strength of the actual structure of society are explained ran through the issues of the JOURNAL for February of last year. Since then we have discussed various aspects of the industrial question as they have been presented by, or have arisen out of, passing events; but we have not been required to signalize the appearance of any notable addition to the literature of the subject. Now, however, there has "swum into our ken" a literary planet of the first order, whose work, when it shall have made its way into men's minds, will be ranked as among the makings of a new habit of regarding familiar problems. This writer is Mr. Benjamin Kidd; and his book is entitled "Social Evolution." Thrown as it has been upon the mighty stream of contemporary literary production, without introduction, and without academic or other credential of its authorship, this remarkable book has already taken its position, and has been recognized as an achievement of social philosophy. It is not for us to deal with a great portion of the author's matter, beyond recommending it for perusal by thoughtful men of every degree; but we are able to say something of Mr. Kidd's offer of comfort to such of us as cannot bring ourselves to believe in Socialism as the goal of civilization; while we fain admit that it represents the only ideal which at present attracts the working populace of this and other countries.

The gravity of the actual position is fully appreciated by Mr. Kidd. He concedes to socialistic literature the position of representing the protest of the lower classes of the population against a condition of existence to which their reason gives no sanction. The great body of workers for wages are not contented with the present dispensation, and cannot be expected to be contented with it, so long as they feel that they are exploited for the profit of the few. Yet to these same workers political power has been committed. As the "Labour" Press continually assures its patrons, and as everybody knows full well, the majority of the voters in most constituencies are of the order that has the greatest reason for dissatisfaction with the existing ordering of society. Why, then, do not these voters rise in their strength, and sweep away the existing order of things? Mr. Kidd has some luminous hints upon this subject for those who consult him.

It is with respect to his treatment of the socialist hypothesis, however, that we have most in common with Mr. Kidd. This author's chief triumph consists in the fact that, startling as the feat may appear, he has carried the force of his reasoning *beyond* the dreams of the Socialists; showing that these are already surpassed by the natural and necessary development of evolutionary philosophy. He points out that it is of the essence of the socialistic ideal that, under its rule, the factor of competition shall be eliminated from the conditions of civilized existence, so that all shall have enough, none shall have too much, nobody shall want anything, and nobody shall hope for anything. Yet it is the central fact of all disputations respecting the powers and prospects of social man that it is through competition, and nothing else, that he has become what he is to-day. Is there any likelihood that man, with all the countless æons of his period of development behind him, will throw the habit aside at the bidding of a theorist like Marx? Not the slightest. Upon this cardinal point, Mr. Kidd says: "The development that will fill the history of the twentieth century, will certainly be the change in the relations of capital, labour, and the State; but once we have grasped the fundamental laws behind that development as a whole, it becomes clear that the change, vast and significant as it undoubtedly promises to be, will, nevertheless, be one essentially and profoundly different, both in character and results, from that which Marx anticipated." In other words, Socialism is not the principle which is in the future to prevail in this work-a-day world.

Yet there are to be changes. "The progressive interference of the State (mostly in the interests of the weaker classes, and at the expense of wealth and privilege) in departments now looked upon as quite outside the sphere of such action, is apparently inevitable." Mr. Kidd is in full agreement with the opinion which was put forward in our last week's article on "The Regulation of Labour in Gas-Works"—that there is a "tendency on the part of Government and the Legislature to assert control over the internal arrangements of industrial undertakings which are yet allowed to remain private property." He believes, indeed, that "the movement in the direction of the regulation, control, and restriction of the rights of wealth and capital must be expected to continue, even to the extent of the State itself assuming these rights in cases where it is clearly proved that their retention in private hands must unduly interfore with the rights and opportunities of the body of the people." But this is not Socialism, although the movement is commonly confounded therewith. "Even in such cases the State will, in reality, assume such functions in order to preserve or secure free competition rather than to suspend it. Hence the general tendency must be expected to be towards State interference and State control on a greatly extended scale, rather than towards State management." Precisely our idea, only arrived at by an independent road.

Worthy of high respect also is that section of Mr. Kidd's work in which he shows how the progressive amelioration of the working-class population—in England, at any rate—is not wholly due to their own efforts, but is being largely aided by the disinterested action of the classes above them in the social scale. It follows from this consideration that the demagoguic common-place which asserts that in all labour disputes the workman must always be in the right and the employers in the wrong, should be finally discredited and abandoned. Hence it ensues that "in the course of the struggle in which labour is engaged against the terms of the capitalist class, and more particularly in those pitched battes which occur from time to time in the form of strikes, that the determining factor is always in reality public opinion." In other words, many of the really important strikes, in which the employers win, would never happen if the stronger side did not also feel that it had the sanction of right and reason. It was this consideration which made the recent Vienna gas-workers' strike, and the strikes of the dockers of Hull, and the gas stokers of Manchester, Salford, and South London such miserable failures. Questions of the efficiency or otherwise of the organization of the contending forces in an industrial conflict have, of course, something to do with the issue; albeit generally by way of expediting or delaying the inevitable result. Broadly speaking, the side that feels itself in accord with the common sentiment of the community is bound to gain the upper hand sooner or later; and the sooner and the more perfectly this paramount truth is realized by the parties to industrial disputes, the better it will be for every interest concerned. The public conscience is extremely sensitive to wrong or unfairness, as Mr. Kidd truly declares. "It is here, and here only, that we stand in the real presence of the force that is moving, regulating, and reconstructing the world around us, without which our progress would cease, and our forms of government be unworkable." We have gone far enough, however, with this author. Those of our readers who desire his better acquaintance must be referred to the original, with which (whether or not they agree with every one of his views) it is safe to predict they will not quarrel on the score of narrowness of purview, prejudice, or inadequacy of expression.

NOTES.

The Spontaneous Combustion of Coal.

In the course of a paper read before the last meeting of the Institution of Naval Architects, Professor Vivian B. Lewes stated that, since his communication to the Institution in 1890 upon the causes which lead to the spontaneous ignition of coal in bulk, he has had an opportunity of investigating the composition of the gases given off during the spontaneous heating of large masses of coal, and has obtained results fully bearing out his earlier conclusions. A large coal-store belonging to the South Metropolitan Gas Company had heated; and the smell which emanated from the surface of the coal was manifestly due to the scorching of organic matter—being almost identical with the smell obtained when a piece of wood is lightly charred; and it was accentuated by a small quantity of sulphuretted hydrogen evolved at the same time. A tube was passed into the mass of coal, close to the heated part, and the gases which were being disengaged were aspirated therefrom and analyzed. The sample was found to have the following composition:—

	Per Cent.
Carbon dioxide	13·15
Carbon monoxide	4·00
Oxygen	1·31
Unsaturated hydrocarbons	nil
Saturated hydrocarbons	5·10
Sulphuretted hydrogen	distinct trace.
Sulphur dioxide	nil
Nitrogen	76·44
	100·00

A considerable quantity of light oil and water deposited in the tube. This oil began to distil at 92° C.; and it had a smell similar to that of wood naphtha. These results show clearly that the heating was due to oxidation of the carbon and hydrogen present, as demonstrated by the presence of carbon dioxide and water, and not in any way to oxidation of the sulphur, as otherwise sulphur dioxide would have been found in the gases which were being evolved, and sulphuretted hydrogen could not have been produced.

The Duty of Electrical Generating Stations.

According to some statistics collected by the "Committee on Data" of the American National Electric Light Association, the claim of electrical engineering to supply a scientific means of obtaining light from coal is not founded upon fact, if in this connection economy of raw material is to be considered as a point of science. It is reported that, over an average of 67 central power generating stations, a duty of 91·7 watt-hours is obtained for every pound of coal consumed. The *Electrician*, commenting upon these figures, remarks that this effect is equivalent to 8·14 lbs. of coal consumed per horse power per hour, or nearly 11 lbs. per Board of Trade unit generated. The report further shows that, where stations have been running continuously, a very much higher coal duty has been realized than where the loads on the stations have come irregularly. For example, in a station running the full 24 hours at a fairly even load, 208 watt-hours per pound of hard screenings were obtained; while in a station doing an irregular service for seven hours per day, only 35 watt-hours were obtained per pound of soft coal. The report admits that, even in the best instances available for comparison, the performance does not compare favourably with the results secured in generating power for manufacturing purposes. This is as much as to say that the electrical distribution of power in commercial competition with other sources is for the present out of the question. Our contemporary takes occasion to observe how much more satisfactory it would be if the duty of power plants was always expressed in terms of an invariable thermal basis. Professor Unwin is credited with suggesting the use of the "carbon value" of the fuel employed, as a means of eliminating a fruitful source of uncertainty. Thus, 1 lb. of the best Welsh steam coal is equivalent to 1·104 lbs. of pure carbon; 1 lb. of the average British coal may be taken at 0·987 lb. of pure carbon; an average sample of coke is worth 0·934 lb. of carbon; while an average sample of patent block fuel is worth about 1·04 lbs. of carbon. As our contemporary argues, the use of such vague terms as slack, duff, &c., with the object of conveying the impression that the coal so described is of inferior quality, is to be discouraged, whether in gas or mechanical engineering.

Kennedy on Boiler Testing.

Professor A. B. W. Kennedy, F.R.S., delivered two valuable lectures at the Finsbury Technical College during the past season on the testing of engines and boilers, the text of which should be in the possession of every steam-power user desiring to satisfy himself as to the fashion in which his fuel is burnt. The lecture on boiler testing is a plain and simple set of directions for the conduct of such tests, in which every detail necessary to be observed for securing a reliable result is given. Professor Kennedy remarks, among other things, that a boiler test of from eight to ten hours is the proper minimum. A very expert hand may, in special circumstances, get a fair test in six hours; but the boiler trials of two hours or so, which are occasionally heard of, are absolutely and entirely valueless when they are not simply frauds. After describing how the fuel and water may be most conveniently measured, Professor Kennedy goes on to explain how the troublesome old-fashioned way of starting and stopping the "run" may be obviated by attending to a few common-sense precautions for securing uniformity of conditions at the start and the finish. Then he shows how the necessary calculations are to be made, and explains the part to be played by the chemist in investigations of this kind. It is interesting to note how the troublesome factor radiation is dealt with by Professor Kennedy. Everybody who has practical experience of the working of furnaces of any kind must have been impressed by a sense of the magnitude of the loss of fuel represented by the radiated heat. The Professor remarks of this loss that he has made various attempts to measure it by finding the amount of coal which must be burnt in the boiler simply to keep up the pressure without any steam being made; but he reluctantly confesses that the method is not a trustworthy one, and that he does not know how to measure the radiation of a boiler. This may often be as much as 8, 10, or 12 per cent. As a matter of fact, it comes into the heat account really as a difference only—a quantity "unaccounted for," but necessarily stated in order to make the account of heat expended tally with that taken away.

The Life of Cast-Iron Water-Pipe.—In the course of his annual report, Mr. G. Murdoch, Engineer and Superintendent of the St. John's (N.B.) Water-Works, gave some interesting information in regard to failures in cast-iron pipe, which has a bearing upon its life. The particulars furnished were based upon observations of breakages in pipes which had occurred in the period covered by the report. A 4-inch main, which had been in use about 33 years, failed in marsh mud under a pressure of 60 to 65 lbs. per square inch. The outside of the pipe had undergone a softening process at the break, which was along some air cells in the body of the shell. The film of metal covering the cells and sand holes was about $\frac{1}{8}$ inch thick, and could be cut easily with an ordinary knife. Below the film and the air cells, the metal seemed to be as clear and sound as when it was first laid. The internal diameter of the pipe was reduced by about $\frac{1}{2}$ inch of tuberculation. Air cells also caused the failure of a 2-inch pipe laid in brick clay. Tuberculation had reduced the diameter of this pipe to about one-half, and its area is about one-fourth of its original size.

Lining Water Tunnels with Concrete.—At a recent meeting of the American Society of Civil Engineers, a paper on the above subject, presented by Mr. Desmond Fitzgerald, was under discussion. In the course of the remarks, several instances of the use of concrete for lining irrigation tunnels and canals in California were mentioned by the speakers. In those cases, 2-inch and sometimes even 1½-inch layers were said to be spread directly on the smoothed surface of the clay cutting, and small tunnels were lined with concrete having 4 inches minimum thickness of ring—*i.e.*, over the points of the excavation; but the irregularities and recesses being filled with the same homogeneous material virtually produced an effective mass 10 or 12 inches thick, which was economical, and in the frostless climate proved durable and satisfactory. The general opinion appeared to be that the principal advantage of the use of concrete in the Boston tunnel referred to had been in its adaptability of application to the conditions of use, and the securing of homogeneity in the entire mass of lining and backing. Some references were asked and given concerning the quantity of water required for the proper mixture of concrete and the shrinkage in final volume from that of the sum of the constituents. Mr. Fitzgerald said that in this work, after two casks of sand and one cask of cement had been five times thoroughly mixed dry, they still occupied a total volume of three casks, which immediately diminished notably when water was added.

The Flow of Water in Pipes.—The *Engineering News* recently contained a diagram for determining the discharge, slope, and velocity of 6-inch to 84-inch pipes flowing full, plotted by Mr. A. S. Tuttle, of Brooklyn, from Kutter's formula, using $n = 0{\cdot}013$. The velocities range from 2 to 6 cubic feet per second, and the slopes from 1 foot in 200 to 1 in 3600; while the discharges range from 0·2 to 220 cubic feet per second. It is stated that the diagram is applicable to the following materials: Ashlar and well-laid brickwork; ordinary metal; earthenware and stoneware pipe in good condition, but not new; cement and terra-cotta pipe not well jointed, and not in perfect order; plaster; planed wood and glazed surfaces of every sort, when in imperfect or inferior condition. This subject recently came before the New England Water-Works Association. It was introduced in a paper presented by Mr. L. M. Hastings, the City Engineer of Cambridge (Mass.), which contained the results of some experiments he had made in measuring the flow of water in a 36-inch pipe, illustrated by profile drawings, &c., and a sample of the current meter used was also exhibited. The results of the experiment showed that the velocities were greater near the circumference of the pipe, and diminished towards the centre; and it made no difference in the velocity whether the gate at one end of the pipe was fully or about half open. By the Gould formula, 8,406,700 gallons of water would pass in 24 hours; by the formula in Trautwine, 8,865,500 gallons; and by the experiment, 8,066,800 gallons.

TECHNICAL RECORD.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

The Half-Yearly Meeting of this Association was held last Tuesday at the Salisbury Gas Company's works. A fair number of members assembled to testify to the regard which they entertain for their old Secretary (Mr. Norton H. Humphrys), who is the President for the year. The visitors began to assemble soon after noon; and most of them inspected the works under the guidance of Mr. Humphrys—the new gasholder which the Company are erecting (and of which some particulars will be found in the President's address) being the centre of greatest interest. The members and their friends were subsequently provided with luncheon, by the kindness of the President.

On taking the chair at the business meeting,

The PRESIDENT introduced to the members Mr. G. Fullford, J.P., the Chairman of the Gas Company, and two of the Directors (Messrs. S. Griffin and W. Young).

Mr. FULLFORD said, as the Chairman of the Salisbury Gas Company, he wished to offer the members of the Association a cordial welcome to the ancient city of Salisbury. He well recollected some ten years ago, when he had the pleasure of attending a similar meeting of this kind, when Mr. Hardick was their President. He (Mr. Fullford) distinctly remembered words which he used on that day respecting Mr. Hardick; and it was a matter of extreme gratification to him to give utterance once more to the same words—that they had long looked upon Mr. Hardick as their staunch good friend, and they recognized then, as they did now, that since his accession to the office of Manager his whole aim had been to do the best he could for the shareholders, and at the same time not to overlook the interests of the consumers. He went to Salisbury known as a "consumers' man;" and he was still the same that day. They had also added to their staff a good and valued officer in the person of the President of the Association. They had now for many years proceeded to a great extent under his guidance; and during those years they had not fallen back in any respect. As was evidenced by the new holder which they were erecting, the Directors still had faith in the future of the gas-works.

The PRESIDENT said it fell to him, on behalf of the Association, to thank Mr. Fullford for his very cordial welcome; and he also proposed a hearty vote of thanks to the Directors for the use of the Board-room.

Mr. D. IRVING (Bristol), in seconding the motion, said the members had been extremely pleased to hear the remarks which had been made regarding their President and Past-President. He did not know anything more helpful to officials such as they were than to have the sympathy and appreciation of their Directors in carrying out their arduous duties.

The motion was carried by acclamation.

Mr. S. GRIFFIN, in acknowledging the vote, referred to the position occupied by the electric light in relation to the gas industry. He considered that electricity had proved to be the gas maker's friend, as there was no doubt that, in those places where it had been introduced, the consumption of gas had increased; and therefore they must regard it as almost a stimulant to the manufacture of gas. He also alluded to the improvements which had been made in gas-burners, and stated that the Welsbach system had been largely introduced in the city.

VOTES OF CONDOLENCE.

The PRESIDENT said his next duty was a somewhat mournful one. Since their last meeting, they had received intelligence of the decease of one of their members—Mr. H. F. Willey, of Exeter; and he had to propose the following resolution: "That this meeting desires to express a feeling of sincere regret at the decease of the late Mr. H. F. Willey, and to record the great esteem and respect entertained for him as one who, for many years, has been a member of the Association. Also to convey a vote of sympathy and condolence to his sorrowing relatives."

Mr. J. LOWE (Weymouth) remarked that he had known the late Mr. Willey for about 30 years; and he much appreciated being permitted to second the motion.

The members passed the resolution by rising.

Mr. H. A. WILLEY said that, by the courtesy of the members, he desired to most sincerely thank them, on behalf of his mother and family, for the kind and generous expression of sympathy which they had extended to them. He might say his father took the deepest personal interest in the welfare of the Association. From the time that it was established, it was a privilege for him to attend the meetings periodically, and to take part in the discussions; and among the members he had a great many respected and life-long friends. He was sure the resolution would be deeply valued by all the family.

The PRESIDENT said he had unfortunately another decease to call attention to—that of the late Mr. John Allan. He was not a member of the Association; but he had attended the meetings for some years, and many of the members entertained the sincerest personal respect for him. He proposed a vote of condolence and sympathy with Mr. Allan's relatives.

Mr. W. J. FULLER (Bournemouth) seconded the motion, which was passed.

NEW MEMBER.

Mr. S. J. Ingram, of St. Austell, was next elected a member of the Association.

THE FEDERATION QUESTION.

The PRESIDENT said there was one question arising from the minutes (which had been taken as read) to which perhaps he ought to refer—that was, the subject of federation. It was announced the last time they met that a meeting of delegates would be held on Sept. 23 last. However, for various reasons, which were explained at the time, it was not found convenient or possible to hold the meeting. But the matter had not been dropped; and they were still proposing to call a meeting of the delegates as early as could be arranged.

THE AUTUMN MEETING.

Some discussion arose as to the place for the next meeting. Frome and Torquay were both proposed; but the members decided in favour of the former town.

The PRESIDENT then read the following

INAUGURAL ADDRESS.

In rising to address you, my first thought is one of gratitude to the numerous friends who have—in some instances at considerable inconvenience and trouble—expressed their sympathy with your President, by attending here to-day. A glance round the room at the many familiar faces, tempts one to launch out into personal references; but as that would savour too much of the mutual admiration society class of thing (which outsiders sometimes tell us is a little too evident at these gatherings), I must be satisfied with thanking you one and all for the many kindnesses received from time to time—both in a personal sense, and as the Honorary Secretary of your Association for the last nine years. But without being invidious, one exception can be made, by congratulating our venerable friend who is supporting me on my right, and who has thrown himself with all the energy of nineteen instead of nearly ninety, into several details connected with the preparations for our meeting here to-day. It is now about ten years since he expressed doubts of ever attending another meeting. But here he is to-day; and we may well hope to see him with us for another decade. Gentlemen, it is with real pleasure that we welcome you here to-day, and express the hope that you will find it a time of benefit and enjoyment.

The position of our Association should be a matter of moment to each member. How does it stand now? And what has it done in the past? Taking a careful survey of its history, I venture to claim that it has justified its existence. As compared with similar Associations, it labours under several disadvantages. One of these societies is able to meet on Saturday afternoons. After a social tea, the members return home; and I presume they all reach their respective residences the same evening. But in the straggling South-west district, extending from Portsea to Pembroke, and from London to the Land's End (we do not claim the Scilly Islands), it is impossible to select a rendezvous that does not involve a long day for the majority, and one night in a strange bed for a good round dozen. In many parts of the country, the socially-inclined gas engineer can call upon two or three of his fellows in the course of an afternoon stroll; but the members of this Association average nearly twenty miles apart. Take our present location for an example. Our nearest neighbour has had to travel 12 miles, and the next in point of distance 18 miles, in order to be with us to-day. The geographical situation is such that, instead of talking about small meetings, one should rather compliment the vitality of the Association in being able to have any meeting at all. There is another drawback. The demand for gas in most of our South-west towns is small. With one or two exceptions, they are simply residential places, occupied by persons that may be ranked as very moderate middle-class people. So that, after marking off the gas-works in some half-dozen towns, the remainder come under the head of comparatively small gas undertakings; and the majority of our members are too much occupied in running the daily round of detail that is incidental to a small works—where the manager, with perhaps an assistant or a clerk, constitutes the whole of the band—to take up the special engineering or scientific questions that are so ably dealt with in other parts of the country. A very ordinary factory town in the North or Midlands would take the whole of the gas manufactured in Wiltshire, and possibly the supply of Dorset as well. It is therefore evident that we are disadvantageously circumstanced, as compared with Associations covering compact and populous districts.

During the last nine years, we have held eighteen meetings, in fourteen distinct towns. In addition to the advantage of inspecting the gas-works in each district, we have visited the Kensal Green station of The Gaslight and Coke Company, the Severn Tunnel, the Great Western Railway works at Swindon and at Wormwood Scrubs, and several other places of interest. So the opportunities for that friendly intercourse and informal consultation, which this Association seeks to foster and encourage in every possible way, have been numerous. [Appended to the address was a list of the papers read at the meetings, with a figure indicating the number of speakers in the discussion following the reading of each communication.]

This affords (said Mr. Humphrys) some insight into the nature of our proceedings. The list includes nine presidential addresses, and 35 communications from 21 members and 4 non-members of the Association. Messrs. Durkin, Jervis, and Riley have each read three papers, exclusive of an Inaugural Address in each case, and have thus practically illustrated their interest in our proceedings in a manner that deserves our cordial recognition. It is well to applaud a good action, but better still to copy it; and I hope that some whose voices are as yet unknown may be induced by such excellent examples to take a more prominent share in the work of the Association. The addresses have touched upon a wide variety of subjects incidental to our industry; and of the papers, 11 were devoted to retort-house apparatus, 4 to purification, 2 to naphthalene, and 5 to the supply and sale of gas. Among the other subjects treated, will be found public lamps, testing mains, manufacture of sulphate, storeage of coal, carburetting gas, and mainlaying. The highest number of speakers in any one discussion was eleven; seven or more took part in several instances, and the average is about six.

It is not possible to estimate the exact degree of benefit afforded by these proceedings; but tangible evidence of such is not wanting. Especially in connection with retort-houses and purifiers, our discussions have resulted in practical effect; and improvements suggested in this way may be recognized in many gas-works in the district. Our Association has also been the means of disseminating a great deal of practical information in regard to the manufacture of sulphate of ammonia on a small scale. This product is now a matter of commercial success in gas-works carbonizing 1000 tons of coal, or even less, per annum; and more than one of our friends has reason to bless the day when he came to a South-West Association meeting, quietly button-holed Mr. Sainsbury or Mr. Jervis, and in ten minutes learned as much about how to make and how to sell sulphate as he could have acquired in a month in any other way. The delicate and many-sided question of how to deal with consumers of gas in the matter of offering apparatus on hire, or other inducements in the direction of new and increased business, has been decidedly shaped by this Association.

In the period under review, our membership has been well maintained. In 1885 the list of members included 69 names; and this is now increased to 76. Nearly the whole of the towns in the district were already represented; so anything in the way of a substantial increase was not to be expected, as there was no scope for it. Although comparatively young (having been in existence for a very few years), the Association had attained a robust adolescence at the beginning of this period. Its rapid development to full dimensions in such a brief space of time, was largely due to the exertions of my predecessor at the secretarial desk—Mr. T. W. R. White, of Sherborne—whom we are glad to see among us to-day; and it stands as a most satisfactory evidence of the executive ability possessed by that gentleman.

It is not to be expected that the grim reaper would be absent; and of those whose loss we deplore, a special reference may be made to Mr. William Osmond and Mr. H. G. Crowe. The presence of these gentlemen was always looked for; and it was a rare thing for us to be without their helpful assistance at the meetings. They were as much at home in the business proceedings as in the social gatherings connected therewith, the enjoyment of which was greatly enhanced by their jovial good humour. I mention these two gentlemen together because they resembled each other in many respects, not the least of which was the warm interest they exhibited in the objects of this Association, and the hearty support they always accorded to it. Another friend whom we have lost is Mr. W. Upton Tinney, whose hospitable welcome of the Association at Winchester will not soon be forgotten. Within the last few weeks we have been saddened by the news of the decease of Mr. H. F. Willey, of Exeter, who has been an energetic member of this Association for many years. When his health permitted, he attended our meetings; and when present, he always took an intelligent interest in the proceedings, and frequently joined in the discussions. Since the issue of the notices convening this meeting, we have also learnt with regret of the decease of Mr. John Allan, who, although not one of our members, was a regular attendant at the gatherings, as the representative of the *Gas World*, and as such had made many personal friends in the South-west district.

We will next glance briefly at a few modifications of the rules that have been introduced. There have been no real alterations, as the objects in view have not altered in any way since the day of our first meeting; and the changes that have been made have only been such as the results of experience suggested for the better and more efficient carrying out of the original programme. The adoption of ex-Presidents as Members of Committee was suggested as a means of meeting the difficulty of getting together a quorum for a Committee meeting, and also of utilizing the valuable experience acquired by each gentleman during his year of presidency. It has been usual to place the seats on Committee equally in all parts of the district, in order to avoid any suspicion of cliquism; but when we have one Committee man in the Isle of Wight, another in Pembrokeshire, and a third in Cornwall, the prospects of getting a full Committee are extremely uncertain. Of course, as time passes, we all become Vice-Presidents and Presidents in turn; and so a time may come when the whole of the Association will be on the Executive Committee. But as soon as that Committee becomes inconveniently large, it will be easy to remedy the difficulty. At present, the rule works exceedingly well. We secure an attendance of eight or ten in Committee, which is sufficient to ensure that the affairs shall be managed with strict independence. A change has been made in the procedure for electing officers, by adopting the plan of issuing nominations, as now generally used by scientific and engineering societies. It was introduced to meet the difficulty that may arise through any gentleman refusing to accept the decision of a meeting. The rules assume that every member is willing to take an equal share in conducting the work of the Association; but experience has shown that several are either unwilling or so circumstanced that they are unable to do so. In one instance, a gentleman who had occupied the position of Vice-President, and was about to be elected President after the usual custom, declined to accept office; and great inconvenience was occasioned thereby. This incident alone shows the necessity that the Committee should be prepared, at each election, with the names of candidates willing to accept office. The existing officers cease to hold their respective posts at the expiration of a stated time; and if others are not at hand to succeed them, the affairs of the Association would come to a deadlock. The nomination papers were introduced to avoid this complication. The only objection urged against them, to my knowledge, is that the Committee have too much power, and are able, if so inclined, to influence the election of their own particular friends. This objection would never be raised by anyone who has had any experience in the working of our Association. There are no salaries or other emoluments, direct or indirect; and the difficulty is rather to find competent candidates for office, than to select from a crowd who are impatiently waiting for honours. It would be impossible, even if one were so disposed, to derive personal advantages from an Association of this kind.

Having taken a cursory view of the past, we are now in a position to consider the present position, and also the prospects for the future. Gas managers' associations must, from their very nature, move with, and accommodate themselves to, the spirit of the day, if they are to be of any real use; otherwise they will speedily pass out of date. The next few years will be a time of trial for us; and it behoves the friends of this Association to consider the course that should be taken in order to maintain its vitality. The carrying out of our rules will suffice to do this; but unfortunately they are neglected in one very important, if not vital, part. They are based on the assumption that every member is equally interested, and will be willing to take an equal share of the work. But the list of communications above referred to reveals the fact that, during the past nine years, only 21 out of 76 members have contributed papers to our proceedings. Some philosopher has remarked that brains are very unequally distributed; but I should be loth to think that the whole of the allowance belonging to the list of members is concentrated in the 21 gentlemen just instanced. I feel sure that many among the remaining 55 are equal to the work of maintaining the standard of our proceedings, and that they will not hesitate to do so, now that the matter has been squarely set before them. The 21 are, for the present, at any rate, almost pumped dry; so we must look to some of our hitherto silent friends to come forward, and bring something that will help us out of the old time-honoured ruts into which we seem to have settled. The work of arranging the programme for the half-yearly meetings falls in a great degree upon your President and Secretary for the time being; and these officials have a right, according to the rules, to look for the support of the members. And unless a very large proportion are willing to accede to the requests for papers, or communications to be read at the meetings, the work of maintaining the proceedings must necessarily fall upon the devoted few; and the willing horses are worked too hard.

When district gas managers' associations were first introduced, it was thought that they might be utilized to some extent for educational purposes. They are quite equal to this object in a general way, for it is to be hoped that no meeting passes without at least one fresh fact or new suggestion being thrown out; but taking the word in its usual sense, as referring to the training of the coming generation, the subject is somewhat too large for us. A central or federated institution might possibly be capable of guiding and directing the nineteenth century fetish which we call Technical Education, in regard to our special industry; and this is but one of many questions that could only be efficiently dealt with by combination. Gas associations in the United States are showing signs of concerted action, in respect to questions of a general, as opposed to a local nature. Several gentlemen in England are beginning to see the advantages to be obtained by working in this direction; and I not only hope, but believe that this feeling will spread and grow stronger. With regard to the coming generation, I begin to think that the young, like the working classes, have plenty to look after their interests, and that the middle aged and the middle classes are equally in need of consideration; and therefore that a district association should direct its attention to the support and assistance of its members, who have passed the preparatory course and are fairly embarked upon the ocean of business life, rather than to catering for a class of students.

In these days of special technical societies and classes, of

chemical and engineering societies, of lectures, and of technical journals, there is danger of getting too much education rather than too little. It is possible to fail from knowing too much, as well as from knowing too little; and, indeed, we may question whether as many failures do not arise from the former as from the latter cause. With such a plethora of information before us, there is danger of becoming mere followers in the tracks made by others. We find there is a certain hedge to be jumped, and hang back till one or two bold ones have tried it; and then over we go in a crowd, and do not know what there is on the other side till we get there. We gather, from a magazine article or from a paper read at a meeting, that a certain system or process has proved successful in regard to one particular district. Information of this sort is necessarily more or less cursory and perfunctory. The novelty is described from one or two points of view only; and the defects are not made so prominent as the advantages, very often for the simple reason that they are not yet in evidence. If anyone doubts the truth of the line "For things are not what they seem," let him take up a new process or system, and attempt to make a practical success of it. Unexpected difficulties arise, necessitating the adoption of special methods for overcoming them. Things that look feasible on paper, turn out quite differently in every-day work. And if the novelty eventually becomes a practical success, it shakes down into a different form from that at first contemplated.

The great defect of present-day education is its tendency to superficiality. A solid and thorough, if narrow, sphere of knowledge is better than a wide and superficial one, and stands a greater chance of practical success; and the knowledge should not soar above or away from the object to which it is applied, but be in close touch with it. With us, as sellers of gas, an intimate knowledge of our own particular patch of Tom Tiddler's ground, and the idiosyncrasies peculiar thereto, is indispensable for the successful application in practice of technical knowledge gained in other ways. In every district there are special local features that will not be gainsaid. There is certainly a very general family likeness between gas consumers in all parts of the world. The classical Greek, the stolid German, the polite Frenchman, the sturdy English, the 'cute Yankee, and the canny Scot, all agree that the gas-meter is a wonderful machine that cannot by any possibility work too slowly; that the inspector is paid, like the income-tax revisor and the rate-assessment surveyor, a percentage on the amounts placed to the debit of the customer; that the price is too high and the quality too low; that the gas companies make excessive profits; and so on. But just as each member of a family has special individual characteristics, so every district of gas supply has its own peculiar features; and the most successful gas manager is the one who is capable of recognizing these, and working them to the best advantage.

This consideration is especially worthy the attention of our young and enthusiastic friends, who know no such word as "fail." Some believers in such a policy have spoilt their position in a new district beyond recovery, by attempting to introduce radical changes, before they had acquired a sufficient footing and influence with their new neighbours to ensure the carrying through of the same. I should not be misunderstood as advocating a sit-still policy, in pressing for the exercise of foresight when introducing novelties either in the works or the district. The man who commences to build and is not able to finish, is to be found in every town, and has existed in every age. The finishing touches of a painting call for more skill than the first outline, and the A B C of any subject is easier than the more advanced stages; and so it is a simple thing to initiate the introduction of a new system or process, but a different matter to make it a permanent success. It is one thing to avoid matters simply because they are new. If they are really worth having, the competent man will see his way to adopt them, and carry them through to the goal of practical success. But it is another thing to stand still for a long time, and then to rush off at a tangent of mistaken activity in some direction or other, no matter where, under the idea of being enterprising and moving with the spirit of the times.

These considerations apply especially in the district represented here to-day. As compared with other parts of the country, coals, ironwork, and almost all other necessaries are dear. Some of us are a hundred miles or more from the nearest foundry, and further still from the source of our coal. All our fire-clay goods have to be brought from the North or the Midlands. With the exception of the single item of labour, which is certainly cheaper than in factory districts, all our expenditure runs comparatively high; and, in addition to this, our undertakings are mostly small ones. Under such circumstances, there is special need for a steady and cautious policy.

Now let me make a few remarks on the works which we have had the privilege and pleasure of showing you to-day. They do not present any special points of novelty; and the general design of them has been more a matter of necessity than of deliberate choice. When you are told that the output now exceeds 80 million cubic feet per annum, you will gather that the weak point is the retort-house and coke yard, which are much too small for dealing in the best and most economical manner with a make of 300,000 cubic feet per day, and upwards, such as we are called upon to provide during at least two months out of the year. Our next important extension will be a new retort-house, of a capacity suited to the work which we require to do in it. We are also sadly deficient in the matter of coal-storeage room, as we found to our cost during the late coal panic. The annular condenser and scrubber are small, as compared with our maximum make; but with the help of a large foul main on the one side, and a washer of ample capacity on the other, they are sufficient for our needs. My arrangements of foul and hydraulic main, tar overflows, &c., have been described before you on other occasions. Our retort settings are plain fours and fives, as the present retort-house admits of no other sizes. They are also well suited to the kind of coal and the class of labour with which we have to deal. It is generally supposed that the use of solid fuel under retorts necessitates a waste in the direction of a 50 per cent. excess air supply; but, by various modifications in the settings, dampers, and chimneys, we have obtained much better results than this. With some of the later settings, the excess air supply is not greatly above that usual with gaseous fuel. There is a feed-water heater in connection with the boiler, that condenses a very large proportion of our waste steam, raises the water to about 150° Fahr. (which means an economy of nearly 10 per cent. in fuel), and enables us to keep the boilers going with screenings from the coke yard. It also acts as a partial purifier for the very hard water with which we have to deal, as a considerable quantity of chalk is deposited in the heater that would otherwise go into the boiler, and subsequently have to be cleaned out. It is a much simpler and easier matter to clean the heater than to scrape a boiler. We obtain a large supply of pure condensed water, which is stored for use in the washer. It is chemically more active than spring water, and leaves no chalky deposits either in the washer, the liquor well, or the sulphate boiler.

The purifier-house arrangements include two independent sets of purifiers. One comprises four boxes, each 12 feet square; and the other two are 20 feet square. Either set can be worked first, second, or independently. They are overhead; and there is a hoist worked by a gas-engine for raising the purifying material. We use both oxide and lime; and during the greater part of the year the whole of the sulphuretted hydrogen is dealt with by one of the large boxes. Up to last winter, we have used Westbury oxide exclusively; but last November, finding ourselves facing the winter's make with uncertain supplies of coal, some of which was very impure, we prepared for the worst by purchasing a cargo of the best Irish bog ore. In consequence, the stock of oxide is at present unusually large. Though cottage property is close to our purifying-house on two sides, we manage to steer clear of complaints as to nuisance.

The meter-house arrangements are worthy of a special word. The house is not a large one; but it contains the meter, the valves for four holders, the two distributing-governors, with all accessories. The arrangement is very compact and convenient, as the whole of the contents can be controlled without going out of doors.

We are now engaged in an important addition to our storeage capacity, by the erection of a new holder and tank. The latter is of cast iron, 105 feet diameter by 25 feet deep; and the holder will comprise two lifts, each 24 feet deep by 103 ft. 3 in., and 101 ft. 6 in. diameter respectively. The nature of the site is loose gravel, covered with a thickness of 4 to 5 feet of soil and alluvial deposit, in which the water rises to a very short distance below the natural surface—a fact that prevented us from excavating to any great depth, and, indeed, caused us some trouble in regard to the work actually carried out. The top soil has been removed, exposing the gravel, all over the site; and a strong concrete foundation has been laid to receive the tank—the soil being retained on the ground to serve for banking up. The guide-framing includes fourteen wrought-iron standards, supported upon short piers or blocks of concrete; and in the general design of the whole, strength and utility have been considered in preference to ornament. When the fact that this work was in contemplation became known, we were favoured with particulars of the new systems for dispensing with guide-framing with which you are well acquainted. While not disputing the merits of these, we had regard to two facts. The first was that this apparatus is to be our sheet anchor, and therefore its reliability must be beyond suspicion; and the second was that our new capital, being sold by auction, could be raised at such a low rate of interest, that the incurring of a reasonable extra expenditure in the securing of that end was not of great importance. Supposing that the saving secured by dispensing with guide-framing was £1000, the interest on that sum, at 4½ per cent., is £45 per annum; and the saving of this sum would not leave a large margin for alterations, repairs, or other expenses that are usually incidental to novel arrangements.

We have exercised a judiciously liberal policy in dealing with our customers; and this may to some extent account for the fact that our sales of gas are remarkably good, as compared with the population of the district supplied, which is simply residential, and an agricultural centre. There are no large factories or industries of sufficient extent to influence the demand for gas. In this respect there is a general resemblance to other cathedral towns. The atmosphere is laden with a heavy and somnolent air of respectability, which discourages much in the way of business push and energy. But notwithstanding these drawbacks, our output of gas averages over

5000 cubic feet per head per annum—a figure that will compare very favourably with busy factory districts. We were among the first to adopt the system, now so general, of letting out gas-stoves on hire; and we have further extended that plan to embrace any apparatus that is likely to induce additional business, with the exception of gas-engines, which should preferably be the property of the user. Our present list of goods out on hire includes cooking-stoves, gas-fires, some 200 regenerator lamps, and various patterns of Sugg's street and shop lamps. Our day and summer consumption is good; and, in common with others, we find that the fluctuations of the thermometer exercise a great effect on the demand. The advent of a stiff frost at once increases our consumption some 10 to 20 per cent.

We have glanced at the affairs of our Association, and at the arrangements of the works here. Let us, thirdly and lastly, turn to the future of our industry. There is a large demand, at the present time, for sensation. People are fond of wild and startling speculations as to the possibilities of the future; and the self-dubbed prophets, who try to meet that demand, depend almost entirely upon imagination. They have tried this upon all sorts of things, the gas industry among the number; and for some reason or another which is not very obvious, these modern sibyls agree in regarding gas as a nuisance, and in rhapsodizing about a happy time when it shall be no more. Not only the ignorant, but also the scientific, who look upon gas managers as a sort of inferior caste, have been most unfortunate in their prognostications about our industry. Electricity is more to their taste; and gas has never, from the first, been popular in philosophical quarters. Sir Humphry Davy, one of the highest authorities of his day, who appropriated the credit of inventing the safety-lamp after George Stephenson had made one, and risked his life in a fiery mine to prove the correctness of the principle, jeered at the idea of supplying gas. Later on, about 1877, gas companies were given a period of four years of grace in which to prepare, not for a "happy," but for a very effective dispatch. But gas has pursued the even tenor of its way, undisturbed either by the ignorant predictions of Mother Shiptons of the cat-and-broom style, or by the equally absurd and wild speculations that have been uttered by persons who are supposed to know what they are talking about.

Plain practical foresight is the essence of successful gas managing; and it is frequently necessary to apply, not our imagination, but our judgment, as shaped by the personal experiences and the history of the past, to the exigencies of the future. Proceeding on these lines, the first thing we learn from the past is that the need for careful and skilful working becomes more and more evident every day. You are familiar with an illustrated advertisement entitled: "The child, What will he become?" as issued by a well-known firm of publishers, which affords much study and thought for parents and guardians. To some extent the child in that picture represents our industry; and "what it will become" depends upon ourselves. Having closely watched the history of gas affairs for the last twenty-five years, I have seen great changes of opinion and policy in the treatment of gas consumers. These changes have not been brought about by the dread of competition, as is frequently stated, but have developed in an independent and natural way. There is a character in one of George Eliot's novels, who had such a keen insight into things that a knowledge of facts was a superfluity to him; and many of those who undertake to instruct the public on gas matters, appear to be of the same kidney.

Twenty-five years ago, the general practice in the matter of laying on new services was to charge the whole to the customer, and perhaps a fee for tapping the main as well. The only idea associated with gas-fitting work was that of a substantial trade profit. Contrast this with the pushing policy of the present day. And the change has been effected apart from the pinch of competition, which very few of us have really felt. In my own case, I can only recall one instance in which the competition of other lights has entered into my calculations; and that was a few years back, when people began to want larger and brighter lights than can be obtained from the ordinary gas-burners. This requirement was met by letting regenerator lamps on hire. Possibly some short-sighted shareholders are all the better for a little outside aid, in leading them to support a progressive and liberal policy; but the gas manager who knows his business does not need the ghastly glare of a 2000-candle (nominal, French measurement) electric light, or the shout of the street hawker of "ile," as a stimulus to his business abilities. The policy that now generally finds favour with gas undertakings is not a new thing brought about by the circumstances of the day. It was inaugurated fifty years ago, and but for the successful examples, which are known to many of us, would not have come into general favour. It is not due so much to the startling effects of electricity or oil, as to the efforts of men whom we most rightly recognize as the pioneers of the gas industry. It behoves us to follow in their footsteps, adopting every available improvement on the one hand, and strictly straightforward and honourable dealing with the various interests of consumers, shareholders, and workers that are committed to our charge on the other.

As we look upon the multifarious and extensive range of duties that crowds upon us to-day, we are apt to wonder what on earth our predecessors of forty years or so ago found to do. We have now to face not only retort, but generator, and other processes for making gas; to consider not only gas coal, but a wide range of solid and fluid hydrocarbons. There is the handling and transit of solid materials, tar firing, and sulphate making; the disposal, to the best advantage, of heaps of coke, which would have frightened the predecessor above mentioned out of his wits. We are expected to be intimately acquainted with a large variety of engines, burners, stoves, and special technical appliances. With all this the JOURNAL OF GAS LIGHTING, like a hard-hearted Pharaoh, found us another duty a few weeks since. How truly we may take up the words of an American writer, and say that, although we call ourselves gas engineers, the whole of our time is devoted to these incidental matters, and that none is left for the primary object of finding out the best and cheapest ways of making and supplying gas. It is mistaken economy when a manager, though actuated by the praiseworthy object of economizing in the item of salaries, undertakes so much of the detail work that he has not time to continually watch and check the daily working results. He is simply taking care of the pence at the office table, while the five-pound notes are blowing out of window in the works and district. Even in a moderate sized works, it is necessary, if all the details above instanced are to be properly and effectively administered, that the mere routine and detail work should be performed by subordinates—leaving the responsible manager free to grasp the reins and guide the course of the whole. In our large railway undertakings, there are departments, each in the charge of a responsible foreman or superintendent under the general care of the manager; so in a gas-works the manufacture and purification, the distribution, the sale of residuals, the hiring of meters and fittings, may be appropriately divided up according to the extent of the business. The accounts office, the drawing office, and the laboratory should be worked as separate departments, but all subordinate to one general control.

But I have much sympathy with the writer in the JOURNAL, who points out the necessity for giving to the public some accurate statements on the subject of gas supply and consumption, by way of correcting the numerous erroneous ideas that prevail. Some of these have originated among persons interested in other forms of lighting; but a great many of them are due to the exclusiveness of gas undertakings, which do not come so much in touch with their customers as they ought to do. In the majority of instances, the consumer knows no one connected with the company beyond the meter inspector and the collector, both of whom have a certain number of visits to get through in a day, and therefore are not inclined, even if they are competent, to discuss matters of gas supply and consumption. The consumers should be encouraged to call at the office, and inquire as to any matters respecting their accounts, their supply of gas, or the best ways of using various gas appliances. They should be received by a responsible representative, who has leisure to attend to them, and is fully competent to explain matters clearly and lucidly. In many of our small towns, the personality of the manager, or of the directors, goes some way towards breaking down these feelings of exclusiveness. Various ways of working in this direction will suggest themselves. One is to post the public up in your doings, by keeping them informed of them. See that a full account of your half-yearly meetings appears in the local press. This is a sure way of securing the support and sympathy of the more thoughtful class of customers. As opportunity offers, show the customers round the works. A little friendly attention in this way is always received with appreciation. Another way of keeping in touch with the public is by judicious advertising. If it pays a tradesman to keep his commodities before the public eye, why should it not be a wise plan for a gas company to do so? Get up lectures and exhibitions when you see there is a need for them, but not before. A little work on these lines will render the ridiculous notions about exorbitant profits, injurious effects of gas, and other things that grow with repetition, much less prevalent than they are at present.

Now it only remains for me to thank you for your kind attention; and to ask you to accord our friends who are helping us by contributing to the proceedings to-day, an appreciative and also a critical hearing, and, when the time comes, to stand up promptly and boldly, and take part in the discussions.

Mr. T. HARDICK (Salisbury) said he rose to propose a vote of thanks to the President for his address. He had taken an extensive field of observation; and he had brought before them things which would not only dwell in their minds, but would help them very materially in the future. It was now some ten or twelve years ago that he (Mr. Hardick) felt that the time had arrived when he should call in some extra assistance; and Mr. Humphrys had been with the Company since then, and had helped them on most materially.

Mr. J. H. CORNISH (Bridgwater) seconded the motion, which was agreed to.

The PRESIDENT briefly acknowledged the vote.

PAPERS READ.

Papers were next read by Mr. A. THOMAS, on "Retorts and Chimneys;" by Mr. D. IRVING, on "The Stapleton (Bristol) Gas-Works Governor-House;" and by Mr. G. J. GOUGH, on "The Prepayment System." The last-named communication is given elsewhere in this issue; and the others, with a report of the discussions, will appear in an early number.

The proceedings closed with votes of thanks to the readers of the papers, and to the President for his conduct in the chair.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

The Eleventh Half-Yearly Meeting of this Association was held at Bury St. Edmunds last Wednesday. Everything was favourable for a successful meeting. The weather was fine, a good number of members assembled, and in the preparatory work of making arrangements for the day the Committee had received the hearty co-operation of Mr. Alex. Mitchell, the Engineer to the local Gas Company. Meeting at the gas-works shortly after noon, the visitors were first invited by Mr. Mitchell to partake of light refreshment; and afterwards he conducted them round the premises, pointing out the most interesting features of the plant. The members then walked to the Town Hall, where the business on the *agenda* was promptly entered upon.

At the commencement of the proceedings,

The HON. SECRETARY (Mr. H. Wimhurst, of Sleaford) remarked that owing to an unfortunate circumstance—the death of Mr. W. Duesbury—it was necessary that they should elect a gentleman to take the chair; and he proposed that Mr. J. Carter, of Lincoln, should be invited to preside for a short time.

Mr. C. W. GRIMWOOD (Sudbury) seconded the motion, which was agreed to.

Mr. CARTER, on taking the chair, said he was sure that the members would all deplore with him the necessity which existed for making even a provisional appointment such as that they had just made. The melancholy circumstance which had involved the loss of Mr. Duesbury to the Association was one of which, on the invitation of the President, they would have an opportunity of marking their sense in a fitting way at a later period of the meeting.

MINUTES OF LAST MEETING.

The HON. SECRETARY read the minutes of the meeting held at Melton Mowbray last September; and they were confirmed.

NEW MEMBERS.

The following gentlemen were elected members of the Association: Mr. H. S. Pike, of Colchester; Mr. T. A. Guyatt, of Ely; Mr. J. A. Smith, of Aylsham; and Mr. C. Snelling, of Thetford.

ANNUAL REPORT.

On the motion of Mr. J. G. HAWKINS (Spalding), seconded by Mr. C. G. GRIMWOOD, jun. (Sudbury), the annual report of the Committee and the accounts were taken as read. The former was as follows:—

Your Committee have pleasure in presenting their fifth annual report to the members of the Association. Two half-yearly meetings have been held—the spring meeting at Cambridge, and the autumn meeting at Melton Mowbray.

The number of members on the 1st of January, 1893, was 62. Three new members were elected during the year; and four members have severed their connection with the Association under Rule 17. Much to the regret of your Committee, they have to report the loss of two members by death—Mr. W. Duesbury, of Cambridge, the President of the Association at the time of his decease, and Mr. Joseph Heydon, of Mansfield, one of the founders of the Association; thus leaving the number of members on the 1st of January, 1894, at 59.

The accounts show that the year began with a balance in hand of £13 18s. 8d.; and subscriptions to the amount of £30 9s. 6d. were received during the year—making a total of £44 8s. 2d. The expenditure has been £22 9s. 8d.—leaving a balance in hand at the end of the year of £21 18s. 6d.; and five subscriptions outstanding.

At the spring meeting, held in the Council Chamber, Cambridge, by the kind permission of the Mayor, the President, the late Mr. W. Duesbury, delivered his Inaugural Address, which was of very great interest to the Association; and Mr. J. A. Fielding read a paper on "The Protection of the Gas Engineer," which was discussed. The members and friends dined together in the evening at Y• Old• Castel Hotel, Cambridge.

The autumn meeting of the Association was held at Melton Mowbray, in the Collis Memorial Hall, under the presidency of Mr. C. E. Jones, P.P. (in the absence, through illness, of the late President, Mr. W. Duesbury), when two very able papers were read—on "Gas Cookers," by Mr. W. H. Mainwaring, and on "Purification of Coal Gas," by Mr. J. G. Hawkins. Both papers elicited good discussions.

Prior to the meeting, the members were entertained to lunch at the gas-works, by the Directors of the Melton Mowbray Gas Company, and in the evening dined together at the George Hotel—Mr. C. E. Jones in the chair, supported by Geo. Fitton, Esq., the Chairman, and Mr. Geo. Rose, the Secretary, of the Melton Mowbray Gas Company.

The officers for the year 1894 were elected at this meeting, as follows: President, Mr. W. J. Carpenter; Vice-President, Mr. C. W. Grimwood; Hon. Secretary and Treasurer, Mr. H. Wimhurst; Auditors, Messrs. F. Weller and Charles Ellis; Committee, Mr. W. J. Wells and Mr. J. G. Hawkins.

The thanks of the Committee are due to those members who have contributed papers during the year; also to other gentlemen who have lent their assistance for the success of the meetings at Cambridge and Melton Mowbray. Your Committee express their desire that each member will undertake to render all the assistance in his power in reading papers and using his influence on behalf of the Association.

On behalf of the Committee,

W. J. CARPENTER, Vice-President.
H. WIMHURST, Hon. Sec. and Treas.

Mr. CARTER remarked that nothing now remained for him to do but to make way for the gentleman who was elected at the last meeting to fill the position of President for the current year. In doing this, he would venture to express the hope (and he felt sure it would prove to be the case) that the year upon which Mr. Carpenter was entering would be long remembered by him as the best one of his professional career.

THE LATE PRESIDENT.

The PRESIDENT, on taking the chair, said his first duty was a particularly painful one. It had reference to the decease of their truly able friend and President for the past year, Mr. W. Duesbury. He was sure all those who knew him thought a great deal of him, of what he did, and also of his character. It fell to him to move: "That the sincerest sympathy of the members of the Eastern Counties Gas Managers' Association and of this meeting be accorded to Mrs. Duesbury and family in the irreparable loss they have sustained."

Mr. MITCHELL, in seconding the motion, said he was sorry the occasion had arisen for him to perform this duty, because he was sure he was not alone in saying that they missed Mr. Duesbury very much. He was confident that all who had known him—if only for a few years—had found that he was in possession to a great extent of that unfailing courtesy and that real fidelity of brotherhood which an Association of that kind was meant to foster. He was ever ready to meet and give to his professional brethren any benefit that it was in his power to impart in the way of information and friendly intercourse, which went far to make life pleasant among those who had to do with what was sometimes very trying work.

The resolution was passed by the members silently rising.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—I am anxious to thank you for the great honour you have conferred upon me by electing me as your President for this year; and I am aware that my many shortcomings, and comparatively short experience, will make my position one in which all your sympathy and indulgence will be needed. I promise you, however, that my energies shall be given to the work before us; and I sincerely hope that the interests of this Association will move a step forward, and that we may all derive some benefit from our meetings.

Briefly sketching by the way the career of this organization, it is pleasing to note the result of the energetic handling it has received, and to offer a few words of congratulation to those whose endeavours have been constant in the welfare, general conduct, and also the utility of all its affairs and doings. I trust that in the future we shall do our very best to maintain and strengthen the position to which the Eastern Counties Gas Managers' Association has attained.

There can be no question as to the benefits derivable from periodical meetings of men whose minds are trained to bear upon one common issue. The interchange of ideas, at any time occurring, must have advantageous effect. Looking back at the work accomplished by the many eminent gas engineers, for the good and improvement of their fellows and the industry generally, we cannot but have a profound admiration for the estimable qualities which have been the mainspring of their toil, and the unselfish manner in which their labours have been continued. The result of so much careful study has been given to us, to our advancement; and the many subjects which constitute our daily business life have been rendered easy of understanding, added to which we may safely say that the fields which have been opened up by suggestive research, continue to yield important returns.

During the past few years, new ideas have been promulgated, and keen attention has been devoted to the more salient features of gas manufacture. In point of fact, gas production may be described as being in an interest-absorbing condition, inasmuch as we would appear to be entering upon a period likely to evolve further important developments, more particularly perhaps as regards the questions of oil gas, carburetted water gas, the enrichment by petroleum spirit, and last, but not least, the handling of raw materials and the reduction of retort-house labour.

Enrichment of poor coal gas by gas obtained from crude petroleum or other rough oils, is now exercising the minds of many engineers; and, so far as I am able to learn, the results obtained are distinctly satisfactory, not only from the fact of cheaply increasing the illuminating power, but that, by its application, the troubles occasioned by deposits of naphthalene are completely overcome—a point in itself worthy of note. Carburetted water gas has certainly taken practical form in this country, and has the appearance of becoming more generally adopted, not only on account of the convenience of being able to produce a large quantity of illuminating gas at comparatively short notice, but that, by its means, the consumption of coal may be lessened; and, in these days of combinations of coalowners and labour disturbances, the presence of a water-gas plant on a gas-works must incline to reduce the anxieties of the manager. How far the coal consumption may be reduced by the application of water gas requires considerable reflection. The quantity of coke required for its production must of necessity become a factor to be considered in the calculations; and I am inclined to the idea that, in the case of the average gas concern, the practical limit of operations is somewhat cramped on this account.

Enrichment by petroleum spirit, as by the Clark process, is

looked on favourably by engineers who have the plant in operation. It is the readiness with which the apparatus can be brought into action that strikes one more particularly; but the certainty of immediate increase in illuminating power is a most important feature. The systems of enrichment by oil or spirit render us independent of rich cannels (which are so very difficult to obtain, and so costly to employ); and they will doubtless become more generally used as time and requirements demand.

Much has been said anent the gas-coal combination; and in some quarters quite an alarming view of the situation has been taken. That it is a matter requiring prompt attention, and careful watching, will not be denied; but I am sure it is unnecessary to jump to the conclusion that because coalowners combine they will succeed in permanently keeping prices above the proper market value. The following opinion of the *Newcastle Chronicle* (dated Feb. 17) will convey an idea as to the feeling of a section of commercial men in the North :—

It is an attempt on the part of the coalowners of this district, especially the owners of gas coal, to artificially raise and maintain the price of coal. The coalowners are just doing what the miners have attempted to do. They wanted to keep up the rate of wages by restricting the cutput, beating blacklegs, and punishing, as far as they were able, all and sundry who sympathized with the independent miners who honestly tried to earn as much money as they could. The combined coalowners will do pretty much by the non-union owners what the miners do by non-union pitmen. There is no difference in principle between the two combinations. We believe the principle is unsound, and that, in practice, it will be found to be injurious. We have repeatedly condemned the exclusive and protectionist policy of the miners; and we now condemn, with even greater emphasis, a like policy on the part of the coalowners. They at least profess to be better educated, and better informed than their workmen. They ought to know something of the laws of trade. If they do, they must know that they are violating its first conditions. They can no more raise the price of coal beyond its market value by combination than the miners can raise the market value of wages by a similar course of procedure. What astounds us is that intelligent men in this presumably enlightened age should recur to customs whose fallacies were exploded generations, almost centuries, ago. Everybody who knows anything about the coal trade knows the disastrous history of the Coal Vend. The arrangements covered by that name went on for a short time. But they were always broken; and when they did break, the competition was keener and more bitter than ever. There are instances where coalowners have made a bargain in the coal trade office not to sell coals below a certain price, yet before the same men who made the bargains had got to the Quayside, they had violated their engagements, not by reducing the price, but by secretly agreeing to allow the purchaser an extra discount or some concession equivalent to it. Something like that will again take place. All the fine-drawn arrangements that coalowners can concoct are valueless in the presence of economic laws, which are as arbitrary and as unvarying as the seasons. If a man has a patent, or half-a-dozen men have patents, he or they may manage to keep up the price of the commodities they manufacture, because there are only a few of them; and their methods of production are protected by law. But it is the height of folly to suppose, when scores of persons are interested in an open trade like the coal trade, that they can be restrained by any voluntary arrangement that a majority of them can make. Supposing the coalowners did raise prices, the gas companies would utilize other products to make gas; and the public would increase their consumption of oil and electricity for both heating and illuminating purposes. We regret extremely that the coalowners have taken this unwise and retrograde step. It is doomed to failure; but assuming that it does not fail, its effect will be calamitous to the entire coal-field.

As a matter of course, we must acknowledge a weakness for low prices of raw materials when we are buyers; but looking at the question broadly, we must also admit that the great fluctuations experienced during the last few years have not been for the general good of gas concerns or trade either. The coal strike or stoppage of the Midland collieries has received considerable attention at the hands of men whose wont it is to place the various sides of the question before us in a readable and instructive manner; but we cannot, unfortunately, point to any likely method of bringing owners and men to work together to their common good. It would appear that the best-intentioned gentlemen, whose great abilities have been so generously given, and so tardily received, do not meet with that confidence, without which a satisfactory solution of this great wages question is impossible. The situation at the present moment is not by any means a reassuring one; and it seems very extraordinary that we have rumours of the owners crying "unremunerative prices" so quickly following the capitulation of last autumn. Whether we are to witness continued bickerings during the next few months, with a further stoppage, yet remains to be seen. Anyhow the market is not likely to be easy or even steady until some well-defined, level-headed settlement is arrived at. If evil conditions are to be constantly with us, I would prefer that of a coal combination to the unsettled state of affairs preceding a miners' strike. There are none of us, I am convinced, who object to pay a fair market value for our requirements—in fact, a price which shall be equally fair to workers, vendors, and consumers; and believing as I do that common sense and reason will ultimately rule predominant, our anxieties on this score should not be allowed to increase.

As regards the handling of coal, &c., we cannot but encourage the zeal which marks the work of the several individuals who make it their object to bring about a means to economy in this respect. There is a decided improvement in the machinery now employed to reduce the heaviest labour in connection with retort-house duties; and I think we may fairly say that undoubted saving has arisen where such machinery has been applied. The elevating and storing machinery as now seen in many works must compare very favourably with the older methods, where material was handled several times previous to reaching the carbonized point. The less we handle the coal, the more economical the working; and it becomes incumbent upon us to see that we do not throw away money by inattention to this point.

Capital has not hitherto been too lavishly expended upon labour-saving appliances in retort-houses; and the extraordinary distrust of means mechanical has always appeared to me to be inexplicable. We have had, I willingly admit, many instances contrary to my remark; but, in the main, gas concerns have neglected to take advantage of or to encourage mechanism in a general sense. We find, even in latter-day construction, retort-houses so cramped that modern notions as to lucrative working cannot be carried out satisfactorily; and that we should give our earnest consideration to these points in future is my idea in bringing the matter under your notice.

We have, however, in these go-ahead days, many means of overcoming difficulties; and the inclined system of retorts recommends itself to one as a means of increasing the production on a given area, especially so in any instance where the retort-house is too narrow to admit of mechanical stoking with horizontal retorts. It is worth noting that this gravitation system is gradually taking up the place predicted for it. The idea must be admitted excellent on all sides; and the working out of details is in such hands as to leave no anxiety as to thoroughness.

It is in the retort-house we must look for still greater economies. The wages item is considerable; and, although it is no novelty to introduce this subject, the fact remains that, per ton of coal carbonized, the charge has increased rather than decreased. There are various reasons why this increase has taken place during the last few years; but cannot we do something to reduce the carbonizing charge substantially. Taking an instance where the works are favoured with wharf accommodation, and where a system of cranes, waggons, and overhead railway is employed, we find that the cost from vessel to store, as far as my experience takes me, does not exceed 1s. per ton. Compare this with the amount returned as the average cost per ton as carbonizing wages; and the difference is not readily arrived at. When we analyze the figures, we find that, roughly speaking, our coal, in a favourable case, costs us slightly over 3s. per ton from the vessel to the coke yard. Now to my mind the figures are suggestive of improvement. Studying the question with a view to a remedy, I have arrived at the conclusion that we have not sufficiently directed our attention to the undoubted advantages and saving to be derived by handling the coal in greater bulk.

Our expenses are piled up by our method of what might be described as fractional distillation, which is going on throughout the country. The weight per charge has not been materially altered, excepting to be reduced, since the days of the ovens; and I am strongly of opinion that our line is not the correct one in fixing such a small quantity of coal for each successive operation. We have undoubtedly obtained as much gas per ton of coal as possible; and it now remains for us to define the limit to which we may go as regards the quantity of coal to be called a charge. If it is possible to largely increase it, the advantageous application of machinery will be still more apparent. It will doubtless be said that, with larger retorts, the structural alterations added to the difficulties to be overcome in adopting new systems, will absorb any saving derivable; but I am convinced to the contrary.

The manipulation of coke appliances as now seen in many important works is a pleasing feature in the march of labour-saving ideas. These systems have the advantage of being methodical, and are carried out at small cost. Storing coke is, however, a very questionable matter; the loss occasioned thereby being an important item.

Taking gas plant in its usual course, we do not find much that is new in hydraulic main details, condensers, washers, or scrubbers; but the question of purification is continually receiving the application it deserves, and is an all-absorbing point to many active minds. We have not, it is true, arrived at a state when purification can be conducted in closed vessels, so much desired, and so necessary where works are conducted in close proximity to towns; but much has been accomplished of an encouraging and highly instructive character. My experience in this direction may be described with perhaps some interest to you. Experimenting with a view to reducing the nuisance occasioned by changing lime vessels, air was admitted at various points previous to the exhauster. The ratio of air admitted to gas was varied, in order to determine the required proportion for distinctive kinds of material; and, in my opinion, 1 to 2 per cent. is a safe figure. Increasing or decreasing, within reasonable bounds, the quantity of air did not wholly produce the desired effect on the lime. By introducing oxide of iron in each vessel—*i.e.*, a layer of oxide 24 inches thick at the bottom, and two layers of lime, each about 7 inches thick on the top—the results obtained were decidedly favourable; the lime being taken out quite dry, inodorous, and presenting a well weathered appearance.

My observations of the working of the vessels have led me to the following conclusions: That it is better to largely reduce the sulphuretted hydrogen contained in the gas previous to allowing it to enter the lime vessels. Moreover, the temperature is increased by using oxide first; and by the consequent comparative absence of moisture, the resistance is lessened. To verify my experiments, I have repeated them since the completion of our new catch purifiers; and we now work with six vessels—four oxide and lime in a cycle, and two oxide catch purifiers. The quantity of lime being increased as required is sufficient to reduce the sulphur compounds within 15 grains per 100 cubic feet; and the material when removed is of such a nature as to cause less anxiety, compared with our previous working, beyond which the cost is considerably reduced.

As regards distribution, great efforts are needed to withstand the inroads of oil and the application of electricity; and the prepayment meter is fortunately standing us in good stead, and assisting us to a degree beyond all expectations. The houses hitherto without gas must have our attention; and we must endeavour to cultivate the small consumer, whose wants in many cases have been somewhat neglected. Given that the fittings cost him nothing, and that gas in fair quantity can be purchased for a penny, I think we may take it to ourselves that our new consumer will not change his light for either oil or electricity, notwithstanding that the latter might be put on his premises on the prepayment system.

The importance of complete workshops cannot be overrated in these competitive times; and gas authorities who neglect this matter will do well to consider it. The more we can do to promote smartness in tackling complaints and the thorough fitting of everything in connection with the consumers' supply will do much to enable us to hold our position in the race for supremacy. I am not prepared to argue that all gas concerns should or should not take upon themselves the whole details of fitting, although much might be said upon the matter; but I am prepared to guarantee the fact that all persons in erecting dwelling-houses or large buildings would do well to obtain the advice of a qualified authority previous to completing their arrangements as to gas supply. Such advice is always at hand; being easily obtainable from the local superintendent, whose ideas as to the sizes of pipes and the materials to be used, as also general views as to what is really required, would doubtless benefit all concerned. To go farther, everything is to be said in favour of the registration of gas-fitters, and a properly constructed schedule for their guidance in any work undertaken.

The growth of our rival electricity does not awe one with its rapidity, neither does the long-promised cheapening of its generation and application become very evident. Previous to the consideration of electric lighting, public bodies were content to rigidly economize in the amount of light distributed in the thoroughfares. Since then, however, we find a general desire for lamps of enormous candle power, even at extreme cost; and, unfortunately for us, the general public, being unaware of the difference between the expense of the ordinary 5 feet per hour gas-lamp and that of the high-power arc light, are apt to make distinctly unfair comparisons. Personally, I do not begrudge the electricians anything they may claim as to the success or non-success of their schemes; but one cannot help feeling somewhat perplexed at the statements as to cost, and amused at the calculations made on the assumption of a possibility of working at full load 24 hours per day.

It is worthy of note that, in providing for the generation of electricity in connection with the Great Yarmouth installation, gas-engines will be employed to sustain a portion of the required load; and I am glad to place it on record that the Local Authority and the Gas Company do not take that pessimistic view of each others' actions as have been, unfortunately, to my mind, too evident in some instances I have known. This is as it should be. We as engineers know we have a place; and as long as we can be of some assistance to one another by breadth of feeling and touch, it is certainly our duty to see that our relations shall run in pleasant grooves.

In conclusion, I feel that our industry is progressing; and as an instance of its financial soundness, it is but necessary to point to the elasticity of its resources during the last few years of comparatively heavy expenses. As may be seen by the returns to hand of gas concerns throughout the country, there is every evidence of a healthy condition of affairs. Large dividends have been paid, and but few instances occur where substantial increases in price have been permanent. The moral points, in my opinion, to the excellence of management—to the tact and ability displayed by all concerned in the administration of gas affairs, and, moreover, to the complete mastery of details as exemplified by the engineers of this country. Gentlemen, these meetings are conducive to this wholesome state of things; and seeing that the past history looks so well, let us persevere, and, if possible, make a finer record for the future.

I sincerely thank you for the kind manner in which you have listened to my remarks to-day; and I can only hope that, in some slight measure, I have made myself worthy of your choice in the office in which you have placed me.

Mr. J. Barton (Peterborough) proposed a vote of thanks to the President for his valuable address. It contained, he said, much of interest; and there was no doubt the members would derive considerable benefit from it by reading it quietly at home when it was published.

Mr. F. Weller (Southtown, Yarmouth) seconded the motion, which was cordially agreed to.

The President, in reply, said it had given him the utmost possible pleasure in doing the little he had done in preparing the address; and he heartily thanked the members for the way in which they had received it. Continuing, he said that the Secretary had been unable to get a paper for the meeting; and so the Committee had proposed that they should discuss the two subjects mentioned on the *agenda*. He would therefore invite the members to deal first with the question of

DIFFERENTIAL PRICES OF GAS.

Mr. Mitchell believed that differential prices for gas were generally advocated on business lines—that was to say, their friends who were in favour of them said that the seller of any article would offer better terms to a large buyer than he would to a small one. Personally, he confessed this looked very feasible; but he thought there was a primary point which the supporters of a differential price for gas seemed to overlook—that the position of a gas company was not that of an ordinary trader. A gas company was a corporation which existed under certain parliamentary powers; and they had to carry out those powers in a way for the benefit of the public whom they were empowered to supply. He did not think that Parliament really meant that they were to sell their product at a variety of prices to suit their customers. He considered that the small consumer was entitled to the same price as the large one, just as the small ratepayer was not called upon to pay a higher rate than the ratepayer who owned a shop or a valuable residence. He contended that on these lines there should be one price to the consumers of an article which could not be obtained from anyone but the company who held certain privileges in a district. He could understand that a shopkeeper, with others competing against him, might well say that it suited him better to get a certain price for any article from a large consumer than to make a universal charge. But a gas company did not supply their gas on the same lines, as the consumer could not go to another shop for a supply of gas. He maintained that a small consumer was entitled to receive a supply at the same price as his neighbour. This was laying it down on a general basis; but when they came to details, they found it was extremely difficult to make two prices. Some gas companies stated that they would allow a reduction to customers burning (say) 100,000 cubic feet. But what about the man who consumed 1000 feet less? Cases of this kind produced a great deal of ill-feeling, and caused the gas manager no end of difficulty in discussing the point with the customer, who would say: "Why should I not have my gas at the same price as my neighbour; is not my money and custom as good as his? He did not think gas companies could despise their small customers. The large consumers were limited; but the small ones formed the bulk of a company's business. He believed in the lowest possible price, and one price to all.

Mr. J. T. Jolliffe (Ipswich) did not think they could lay down any hard-and-fast line as to differential prices. There were certain cases and occasions when it was necessary to make a difference, although in principle he believed the price should be as nearly uniform as possible, as he could see no real or valid reason why there should be great differences. It was true the large consumer took a considerable bulk of gas; and therefore the amount of leakage from the pipes supplying him was small in proportion. But admitting this, and admitting also that the cost of collection in his case was lower than for a multitude of small consumers, yet he thought if the two were added together, it made such an infinitesimal difference that 5 per cent. would cover it. He could not, however, help looking a little farther than this, because he had a case in mind in which a large factory was now considering the advisability of going in for a gas-engine, and it was a question whether they should adopt a Dowson gas plant or coal gas. They could not use the latter at the price at which it was sold in the town of which he was speaking. Might this not be a case in which it would be expedient to try and meet the customer? It was possible they might allow them a rebate, and yet make it answer their purpose to supply the gas. Personally, he was against having large differences, if they could be avoided; but there were times when it might be to the advantage of the company to charge a differential price.

Mr. J. G. Hawkins (Spalding) said he did not like differential prices, if they could be avoided; and he instanced a similar case to that mentioned by Mr. Jolliffe. One of his consumers had a large gas-engine; and he was talking of putting down a Dowson plant, unless the Town Commissioners were prepared to make a considerable reduction in their price for gas. He (Mr. Hawkins) made inquiries as to what the Dowson gas would be likely to cost per 1000 cubic feet; and he was told it would be about 6d. [Some of the members disagreed as to this figure.] If they were expected to reduce the price to anything like that figure, he thought it would be better to let them put down a Dowson plant. There was no doubt it was a very important question as to whether a reduction should be allowed to people who consumed gas for motive power. The gas was used in the daytime; and he liked to encourage day consumption as much as possible, as, if they could increase it, they

lowered the leakage in a corresponding degree. He thought they ought to take this into account; but it should only be applied to users of engines, stoves, and appliances employed for purposes other than lighting. If possible, however, he should like to see the price reduced to every consumer to the lowest possible point, rather than have differential charges.

Mr. WIMHURST referred to the system of discounts which he has in vogue at Sleaford. He said the charge for gas was 3s. 9d. per 1000 cubic feet. But at the end of the year they went through the accounts, and if a man had used between £10 and £20 worth of gas, they allowed him 5 per cent.; between £20 and £30, 7½ per cent.; and above £30, 10 per cent. They found that this plan worked extremely well; but, of course, it involved a little extra clerical work. What he maintained was that, in the case of large consumers, more profit was made; and so if they could give them an advantage, it was their duty to do so. Collection of their accounts cost less; the leakage was not so great; and at Sleaford they never made a bad debt through a large consumer. For many years past, they had found their system work very satisfactorily; and the other consumers did not grumble at the price charged them. He might add that 60 per cent. of the gas was burned by consumers entitled to the discounts.

Mr. JOHN WEST (Manchester) was invited by the President to join in the discussion. Having remarked that he was pleased to find there was a difference of opinion on this question, he said that most of them generally adhered to the method in vogue at the place where they were brought up. In his own case, however, he might say that he received his training at Northampton, where they had what he might call *very* differential prices; and he believed they still retained them. During his experience there, he found there was a little discontent in connection with the system. A man was supposed to have a reduction if he burned 150,000 or 250,000 cubic feet; and this brought about some dissatisfaction. It was a question of "crossing the line." He had known of one or two cases in the large shoe factories where they had looked at the meters to see if they had crossed the line; and, if they found they had not, and were within reasonable distance of it, they had actually blown the gas away, in order to get over it. This was a waste which he objected to on principle; and from his fifteen years' experience at Northampton, he did not think the system was fair or equitable. As Mr. Mitchell had observed, gas companies came somewhat outside the lines of ordinary commercial transactions. They had no competition, but they were monopolies regulated by Act of Parliament; and he fancied the Legislature imagined that the companies would each fix a price common to all consumers. Taking two grocers or two tailors who were selling things on commercial lines, and one happened to be in a position to burn a larger quantity of gas than the other, the gas company, by charging the wealthier man a lower price, handicapped the poorer tradesman. This applied more especially to engineering businesses, where they had a large number of men using gas rather lavishly. He (Mr. West) did not think it would be just to handicap him against another man in his line of trade in Manchester. He was a respectable man, and paid for his gas as the account became due; and he could not see why the suppliers of gas with a monopoly, should tax him because the other man happened to be rather a better customer. The supply of gas was a very different thing to his own business, in which he had to buy and sell goods in competition with others. He would go into the open market, where he had a good many people he could buy from; and then, of course, the question of percentages came in. Again, when he was in competition with others in selling his goods, then it was perhaps to his advantage to give a little extra discount so as to secure an order. He held the firm conviction that every shareholder of a gas company was entitled to his full maximum dividend. Now assuming, for argument's sake, that they had to make a profit of 6d. per 1000 cubic feet to pay the shareholders' dividend, why should they ask one consumer to pay 8d. or 9d. per 1000 cubic feet towards this profit, and another man only 3d. or 4d.? He maintained that they should ask the consumers to pay a price that would make up the dividend fairly all round. It seemed to him that the "little fish" were becoming very sweet to gas companies now. In London they were rapidly taking up small meters; and they would in some districts become the chief supporters of the gas companies. His conviction that differential prices were wrong led him to consider how he could upset this pernicious system when he went to Maidstone. It was not carried on there on a large scale; but most of the large consumers had gas at a price much cheaper than the others. He went in for reducing the price to the lowest possible figure, and to serve all alike, even the Local Board. He did not see why the Board should be supplied at a lower figure than anyone else, as they were merely a multiplicity of small consumers, with considerable leakages. There was one very large firm who entered into a seven years' contract at a rather high rate; but through the improvements in the manufacture of gas and the consequent reductions in price, they were paying more than the other consumers before the contract expired. They thought that the Company would then allow them to start again at a much lower rate; but he came to the conclusion that the margin of profit was so small that they could not afford to let them have gas at a cheaper rate than other people, although they consumed about 7 million cubic feet per annum. At the present time, he believed the gas consumers at Maidstone were all on an equality; and he did not think there was an individual who paid less than any other, not even excepting the Local Board. Of course, there were cases, such as the one Mr. Jolliffe had indicated, where a small discount might be allowed. If, for example, they had a Government establishment taking a quantity of gas direct from the works, that was worth something on account of the saving of leakage, and in certain instances large consumers might be granted a small discount. With regard to encouraging the use of gas for domestic purposes, he thought it was questionable whether the price should be reduced; but he had an open mind as to the desirability of allowing a little larger discount for gas supplied to engines for manufacturing purposes during the daytime, to keep the mains going. Gas managers should not be frightened by Dowson gas. When he was Engineer at the Manchester Gas-Works, this bogie was put before him; and he made some experiments, with the result that he found an engine required four or five volumes of the Dowson gas to one volume of Manchester 20-candle gas. Besides this higher consumption, they had to add the interest on the Dowson plant, and the cost of manufacture; so that he did not think gas managers need be afraid of Dowson gas coming into competition with them for engines. Of course, it was convenient to have Dowson gas in works where ordinary gas could not be obtained. Briefly, his own opinion on the question under consideration was that they should have one price; and in very exceptional cases a small discount might be allowed.

Mr. BARTON stated that he was not an advocate of differential prices, as it was not fair to the small consumer, who like the large consumer, used as much gas as he required. When they were considering the price they would charge for gas, they took, of course, the working expenses and interest charges, and found what the gas would cost delivered to the consumers. Some of them sold gas as cheaply as they could afford; and after they had paid all charges, they had something less than 1d. surplus per 1000 cubic feet. Now if they charged a differential price, they would be selling the gas for less than it cost; and would this, he asked, be fair to the small consumer? He maintained that it would not, as it prolonged the time when they would make a certain profit which would enable the gas company to reduce the price to their small customers.

Mr. CARTER remarked that, as far as the discussion had gone, it had left his mind in a somewhat perplexed condition; and he believed that he could in half an hour produce reasons and arguments in favour of either course, which might be unanswerable. He thought it was a question which should be settled in every case with regard to what was expedient. He did not think they would be successful in claiming parliamentary sanction only for an identical price. It was true that most of them had a maximum price imposed upon them, above which they could not go; but he never heard of a Parliamentary Committee requiring any gas company or corporation seeking legislative authority to give an undertaking that they would not go below a certain figure. He believed they were to be at liberty to go as far as they liked. It seemed to him that the case was well illustrated by Mr. West. In the first part of his speech, he vigorously contended for one and the same price in a district; but, at the close of his remarks, he said that conditions and circumstances might obtain where it would be advisable to give the position away.

Mr. A. DRAGE observed that at East Dereham their make of gas was only about 10 million cubic feet a year; and he believed they charged the most differential prices of any undertaking round about. They charged 3s. per 1000 cubic feet for gas consumed in stoves during the summer; 3s. 9d. for gas used in engines; and 4s. 6d. for lighting. The reason they charged these different prices was because gas-stoves were used more in the summer; and were it not for this consumption, they would hardly be able to keep a man going in the summer. The gas-engines were also used very much during the summer. Out of their make of 10 millions, the engines consumed 2 millions; and the stoves 1½ millions—making 3½ millions, which he did not think they would sell if it were not for the differential charges. He thought if small gas undertakings would take up this question more, they would find an increasing consumption during the summer months.

Mr. BEST believed that gas companies, especially small ones, would do a good stroke of business by taking off, if possible, 4d. or 6d. from the price from the beginning of April to the end of September. He did not believe in making a concession to the big consumer, because as a rule he was in a large way of business, and was earning more money than the small consumer, and therefore could better afford to pay.

Mr. F. WELLER (Southtown, Yarmouth) expressed the opinion that, in the case of small works, it was necessary, in order to keep the large consumers, to make them some reduction. In his own case, if they lost one or two of their consumers—the Great Eastern Railway Company and the Corporation—they might have to shut up shop. He believed he had in his district one of the largest gas-engines working in the Eastern Counties (24-horse power); and he did not think he would have had it if they had not made some difference in the price. They had, like Mr. Wimhurst, a kind of sliding-scale. If a consumer used (say) £20 worth of gas, he obtained a discount of 5 per cent.; and for cooking they had reduced the price 6d. per 1000 cubic feet,

so as to encourage day consumption. Large undertakings could be more independent than small ones making (say) only 14 million cubic feet per annum.

The PRESIDENT, in closing the discussion, said it had been very instructive. Like many of the speakers, he did not see how they were to avoid differential prices in certain cases; and at Great Yarmouth, they had one or two instances where they were obliged to make a reduction. He then invited discussion on the second subject mentioned on the *agenda*—viz.,

ARE METER-RENTS DESIRABLE?

Mr. C. W. GRIMWOOD was not favourable to the imposition of meter-rents. At Sudbury he charged no meter-rent whatever; and nothing for the services or the main cocks. Incidentally alluding to the penny-in-the-slot meters, he said he had tried to introduce them, but had been unsuccessful; and returning to the subject of meter-rents, he remarked that perhaps he was putting rather a hackneyed question in asking, Why should gas companies charge for their measures any more than butchers or other traders? In his opinion, they ought to charge a price for the gas sufficient to cover the hire of the meter; so that they should not be bothered with these unpleasant rents. The first duty of the gas manager he considered was to earn the shareholders' dividend; and his second duty (which was almost as important) was to satisfy the consumers, and to keep on as friendly relations with them as possible. The more comfortable they made things for the consumer, the larger the number of consumers they would get.

Mr. WIMHURST held that gas companies were entitled to charge meter-rents. They had some consumers who in the summer time only used 100 or 200 cubic feet of gas, and he had cases where they burned no gas at all; and to saddle the general body of consumers with the charge for the use of the meters of such consumers would be unjust. Mr. Grimwood had referred to grocers, butchers, and other traders who used scales and measures; but there was no similarity between them and the meters of gas companies. One set of scales or measures was used for all customers; while each individual gas consumer required a separate meter. In his opinion, therefore, the charge for meters was justifiable.

Mr. H. S. PIKE (Colchester) thought this a question which should be left to each gas company to settle for themselves. In some places they found a great deal of feeling against the payment of meter-rents; while in others they were paid very cheerfully, and the consumers would value more highly a reduction of price than they would the abolition of these rents. He also considered the charge was fair and justifiable. A comparison had been made between scales and meters. But they had to spend a certain amount of capital on the meters; and the probability was that a great number of them in the summer time were doing nothing, and so the capital expended on them would be lying completely idle during that time, which was not just to the rest of the capital.

Mr. MITCHELL remarked that, as a question of equity, to give meters free was decidedly unfair. Mr. Wimhurst had touched upon the point of the whole question—that the meter was had by a consumer for his personal use. Supposing a man burnt 20,000 cubic feet of gas a quarter through a 3-light meter, while another consumer using the same quantity, from the nature of his business and the number of lights and hours he had to use gas, would want a 20-light meter, if they did away with meter-rents, they would be doing an injustice to the man with the 3-light meter. More capital would have to be spent to supply the 20-light meter; and therefore rents should be charged according to the size of the meter.

Mr. JOLLIFFE mentioned that, in all Acts of Parliament, the power was given to the consumer to purchase and use his own meter; and therefore if gas companies did not charge meter-rents, the man who did not buy his own meter had an advantage over the one who did. On this ground alone, he thought that meter-rents were justifiable.

Mr. J. H. TROUGHTON (Newmarket) thought it better that each company should decide this matter for themselves. In his town they charged meter-rents; and he thought it was the fairest thing to do.

Mr. HAWKINS was of opinion that the meter-rent system was the only fair way of making the user of a large meter pay a proper amount. There was no doubt that the meter was as much a part of the plant as the gasholder or the retort-house; and as it was purchased out of capital for the special use of the consumer, he ought to pay for it.

Mr. WEST observed that during the whole time he was closely connected with gas-works, in all cases they charged meter-rents; and they looked to the profits from these rents to help to pay the dividend. During the period he had anything to do with the meter-rent system, he did not remember anyone objecting to it; and it seemed to him to be the most equitable way of charging for meters. If they did not charge for them in this manner, they would have to raise the price of gas. In certain localities where cottage consumers were being supplied, they had combined the rent of the meter and fittings with the price of gas; but so far as he knew, no one had given up the principle that there should be a certain profit derived from the meters. Like Mr. Hawkins, he looked upon the meters as part and parcel of a gas-works.

Mr. CARTER thought that the movement of the past two or three years with regard to the penny-in-the-slot meter had to a certain extent given away altogether the question of charging meter-rents. They had seen the development of a system in which a charge was made not only to cover the cost of the gas but also the cost of the provision of the meter and the fittings; and if they were to try from now to the day of judgment to determine this question on the strict basis of what was fair to each individual consumer, they would be trying to solve what it was impossible to solve. His own opinion was that if, in any place where it was the custom to charge meter-rents, they were viewed with anything like disfavour, without any hesitation he should say sweep them away. He had not made a calculation; but, speaking roughly, if they were to surrender the whole of the revenue derived from meters, he did not think it would add more than 1d. to the price of the gas.

Mr. J. O. PASK (Bungay), alluding to Mr. Carter's latter remarks, asked what he would do in the case of consumers who did not burn gas at all in one quarter. He had found considerable dissatisfaction caused by charging a meter-rent; and some small consumers had been lost through it. But as a matter of justice all round, he thought a rental should be charged.

Mr. BEST agreed that the meter-rent system was the best; but he could not concur with Mr. Carter that, if they abolished it, it would not add more than 1d. to the price of gas. In his case, it would mean 1½d. or 2d. In their Acts of Parliament or Provisional Orders, the standard price of gas was fixed at a certain point; and beyond that point they could not draw a dividend. If they abolished the meter-rents and so knocked off 1½d. or 2d. per 1000 cubic feet, they depreciated the dividend by something like 25 per cent.

The PRESIDENT closed the discussion by saying he was in favour of meter-rents, though they ought to make the charge as low as possible, so as not to hurt the small consumer.

THE AUTUMN MEETING.

On the invitation of the PRESIDENT, it was agreed to hold the next meeting at Great Yarmouth, on the second Thursday in September.

VOTES OF THANKS.

The members fitly acknowledged the kindness of the Corporation in lending the Association the room in which they had assembled that day, and also expressed their obligation to Mr. Mitchell for the hearty reception he had given them.

At the close of the meeting, the members visited the famous ruins of the Abbey of St. Edmunds and the Botanical Gardens; and later they dined together at the Suffolk Hotel—among the guests being the Chairman of the Gas Company (Mr. T. Ridley). On Thursday morning, those members and friends who stayed all night in Bury, drove, at the invitation of G. H. W. Hervey, Esq., in brakes to the Marquis of Bristol's seat at Ickworth Park, some four miles distant, where they were met and received by Mr. Hervey, and conducted over Ickworth House, and shown round the park and gardens. He subsequently invited them to lunch in his residence, Ickworth Lodge, where they were met and received by the Marquis. The President expressed to Mr. Hervey and to Lord Bristol the Association's appreciation of their great kindness in affording the members such a treat as a visit to the mansion and grounds, and of Mr. Hervey's hospitality in providing lunch for them. The members then returned to Bury, where they dispersed, after one of the most enjoyable meetings the Association has held.

Death of Mr. G. Burt.—The death is announced of Mr. George Burt, head of the firm of Messrs. Mowlem, Burt, and Co., the well-known contractors. It took place suddenly, as the result of heart disease, last Wednesday, at his residence, Purbeck House, Swanage, in his 79th year. Deceased filled the office of Sheriff of London and Middlesex in 1878. He was also one of Her Majesty's Lieutenants for the City; and a Magistrate for London, Westminster, Middlesex, and Dorset. He was the proprietor of both the gas and water works at Swanage.

Death of Mr. W. Syms.—We regret to record the death, on the 15th inst., in his 74th year, of Mr. William Syms, who for upwards of 36 years filled the position of Secretary and Engineer of the Rochester Gas Company. Deceased had been in failing health for some months; but there was nothing to indicate that his active life would soon come to a close. In his early years, Mr. Syms devoted much of his leisure to general reading and the study of chemistry; and he subsequently gave lectures on this and other scientific subjects at the old Mechanics' Institute at Chatham, of which he was for some time the Secretary. His studious habits enabled him to qualify himself for the appointment with the Rochester Gas Company, whose business he helped greatly to develop. He was for a considerable period one of the Auditors of the Brompton, &c., Water Company; and he served in a similar capacity various other institutions in the neighbourhood. Mr. Syms had a numerous circle of friends; his company being much enjoyed by all with whom he was brought into social intercourse. He has left a widow and four sons. The funeral took place last Saturday.

PROFESSOR LEWES ON LONDON COAL GAS.

In the JOURNAL last week (p. 706), we published the text of the paper on "London Coal Gas and its Enrichment," read by Professor VIVIAN B. LEWES, F.I.C., F.C.S., at the Society of Arts on the 11th inst. We now give a condensed report of the discussion thereon.

Mr. C. C. CARPENTER, referring to the percentages of oxygen and carbonic acid, especially the latter, shown by the analyses, asked Professor Lewes if he considered it possible, with so high a percentage of carbonic acid as 0·75, to purify gas from sulphur compounds on the present system. He should also like to know how it was that so large a percentage could "run the gauntlet" of the lime boxes. This remark applied equally to the oxygen. There was a considerable quantity of sulphide of calcium in the lime boxes, and of sulphide of iron in the oxide boxes, both of which had an attraction for oxygen; and he could not understand how so much managed to get through. In 1851, 1876, and 1884, there appeared to be no carbonic acid whatever in London gas; and nearly all of the purification was still done by lime. Notwithstanding this, however, the percentage in the Chartered Company's gas had gone up to 0·61.

Mr. J. WEST said the general public were, as a rule, very ignorant on the points brought forward in the paper; and therefore they were much indebted to Professor Lewes for emphasizing them. Some twenty years ago, when he read a paper on a similar subject, it was supposed that gas engineers were against improvement. But he took it that it was as much to the benefit of gas companies as of consumers. It was well known to all gas engineers that the gas they made was not properly consumed, owing mainly to defective burners. If the public would spend a few shillings on proper burners, they would get the value from the gas which had been indicated. A few years ago, when reading a paper on this subject in Manchester, he selected a number of burners from the public thoroughfares, and put them side by side with some of the most scientific burners made; and he was even surprised himself to find what poor burners were in use. Many of them were really not giving more than 25 per cent. of the light the gas was capable of yielding. A very important point was the regulation of the supply of gas at the point of ignition; and he recommended that all burners should have a governor attached to them. He understood that at the regular testing-stations in London, the gas showed an average illuminating power of 16¼ candles; but he noticed that, at one place where Professor Lewes had tested it, it did not reach this standard. He should like to have this explained. He once had a similar experience in a large city, where, at the legitimate testing-stations, the gas had its full illuminating power—it being tested there on a live main, wherein the bulk of the gas was on its way to the consumer. But, in the same city, others could not get anything like the illuminating power he obtained. It was afterwards found that, in the place where they had a bad record, the gas in the mains was very stagnant—there was none passing through them—and the services were small; and he did not consider that such a place was a proper one for testing the gas. There had been attempts to test at dead ends, and so on; but he did not think this was what the Act of Parliament intended.

Mr. F. LIVESEY congratulated Professor Lewes on his boldness in bringing forward, in what he called a paper intended for consumers, a proposition to reduce the quality of gas, because, in all probability, the general opinion would be against him. At the same time, he (Mr. Livesey) desired to support this view, for the following reasons: Gas companies had two keen competitors—the electric light, which was used by the rich; and petroleum, which was used by the poorer classes, and was now sold at 4d. a gallon. The prosperity, and even the existence, of gas companies now depended on their supplying cheap gas, which was wanted in a great city not only for lighting but for other purposes. The late Sir William Siemens advocated a dual supply—one for lighting, and the other for heating and motive power. But, now that the streets were so crowded with gas and water pipes and telephone and electric wires, it was quite impracticable to consider this at all. There must be only one system of mains. If there were a lower quality of gas, no one would suffer much who wanted it for lighting; and those who used it for heating and cooking purposes would be gainers. If the enrichment of gas could be done away with, the price could be reduced; and if it could be brought down to 2s. 2d. or 2s. per 1000 cubic feet, the demand would be enormous, and the smoke nuisance in towns might be largely reduced. Gas companies were now supplying the poorer classes with "coin" meters, the demand for which was very great. He knew a case where a poor woman and her children, not properly clothed, burned gas during the intensely cold weather last January to keep themselves warm. They could find pennies to put in the meter, but they could not find enough money to buy coals. In one of these meters was found the sum of 10s. which had been put there in a comparatively short time. If gas might be sold as it was made from Durham coal, without enrichment, the price could be reduced, and the supply would be more regular. To be sure of escaping penalties, gas of 18-candle power was often sent out; and this was not so well suited to the burners, and caused a smoky flame. Gas of 15-candle power would not diminish in quality so much between the works and the point of consumption. Whenever a gas company proposed anything, the public thought they wanted to take some advantage of them. But this was not so at all; they wanted to be able to supply cheaper gas, and to avoid being brought up at the Police Court, in company with criminals, and fined. Unfortunately, good burners were expensive; but he held that if Professor Lewes turned his attention to flat-flame burners, he would find it possible to greatly improve them—indeed, it had been done to some extent already. The flame should burn under a higher temperature, with the air supply regulated. If the gas came out at its full flow, it was impossible to get all the light out of it.

Mr. G. T. BEILBY said he had been much interested in the paper, and especially in the suggestion that the illuminating power of gas should be reduced; his firm opinion being that, in consequence of the competition of electricity, a change in the opposite direction was more likely to be pressed for. He understood the reasons given for the proposed change were that the cost of enrichment was expensive; that this enrichment was to a great extent lost in the passage of the gas through the mains and pipes; and that the consumer used the gas so badly when it reached him that the difference of 2 candles in illuminating power would not be practically noticed. These were certainly very strong reasons; but he should like to give one or two reasons for dissenting from them. No detailed figures as to the cost of enrichment had been given by Professor Lewes; but Mr. Livesey had suggested a possible reduction to 2s. 2d. or 2s. if enrichment were given up. This put the cost of enrichment at 3d. or 4d. per candle. Now, certainly, gas was being enriched by means of oil in the North at ½d. per candle per 1000 cubic feet in a thoroughly practical way; the gas, as delivered, being as permanent as before enrichment. At this rate, the total cost of enriching London gas to the present standard would be only 1½d. per 1000 feet. On the third point he could only speak in a very general way; but to consume gas economically in flat-flame burners, which were the only ones practicable, was, to a large extent, a question of pressure. With gas of high candle power, one might safely use higher pressure at the burner without unduly lowering the illuminating power. He was pleased to hear Mr. Livesey refer to the improvement of the flat-flame burner, for they could not afford to throw it aside. Those who had had experience with regenerative and incandescent burners knew how unsuitable they were for use in the ordinary houses of the poorer classes.

Mr. C. GANDON agreed with Professor Lewes that it was a mistake to endeavour to produce gas of high illuminating power in the Metropolis. In Scotland, where they were in the region of the cannel fields, it was a different question altogether. In the interest of both consumers and gas companies, it would be better to have gas which could be made from Durham coal without any enrichment. Professor Lewes said that 15-candle gas could be produced from such coal; but he did not think this could be taken as the minimum, because it was liable at times to fall below that. He thought no restrictions should be placed on the companies by Parliament; but they should be left free to produce the best gas they could, and at the cheapest rate.

Mr. C. E. BOTLEY thought hardly any gas engineer would controvert what had been said as to the desirability of educating gas consumers in the proper use of the article supplied to them; and most engineers had endeavoured to furnish information by circulars and in other ways. But, though much improvement had been effected of late years in the utilization of gas, very often information proffered by gas companies was looked upon with some suspicion. If the public would only pay a little more attention to what they were told, many complaints would disappear. An important matter was to have a good pressure of gas up to the point of ignition, and there to regulate it, so as to maintain a steady flame and get the maximum amount of light. One point not yet touched upon was the shape of globes. The old-fashioned globe, with a narrow bottom, acted as a chimney, and distorted the flame; whereas one with a wide opening, which simply protected the flame from side draughts, allowed the maximum light to be obtained even from flat-flame burners. He was not surprised to see the percentage of carbon dioxide, after learning the quantity of water gas used, and knowing the difficulty there was formerly in getting rid of the large amount of carbonic acid produced in this way; but, on hearing what followed, he concluded that he must be mistaken in this view. He thought it would be well to lower the illuminating power of gas. But, whenever a gas company went to Parliament, the struggle always was to raise it further; and he rather doubted whether lowering it would not increase the trouble some managers had with naphthalene.

Mr. PRICE asked if the figures given for the flat-flame burners were arrived at by passing the gas through them at such a rate as would give the best results, or at what might be called the ordinary rates. He said he found, on testing flat-flame burners which were supposed to be consuming 4 cubic feet per hour, that they were really passing 10 or 12 cubic feet; and when the flow was reduced to about one-third, the improvement in the light was very noticeable.

Lieut.-Col. A. CUNNINGHAM, R.E., asked how it was that sulphur was not mentioned as a constituent of the gas in any of the analyses contained in the paper. It was stated that there was not much change in the constituents of coal gas during the last forty years; but he noticed that in the two principal ingredients—hydrogen and saturated hydrocarbons—there was

considerable change, and in some of the minor constituents. Nitrogen, for instance, which was of no use, had increased from only 0·3 per cent. up to 0·6 per cent.

Professor LEWES, in reply, said the increase in nitrogen since 1851, when it was only 0·38 per cent., was due chiefly to the use of clay instead of iron retorts, which were more easily cracked; and thus allowed air to get in. Another reason was that in most works now a small quantity of air was mixed with the gas for purification purposes, which added to the nitrogen which got in through leakages. Mr. Carpenter raised a point of some interest and importance when he asked how it was that there was no carbonic acid in the analyses until 1894, and then there was from 0·25 to 0·75 per cent. Well, the fact was, it was not there now; but, in applying the present process of analysis to enriched gas, they always found carbonic acid, although really it was not there. The reason was that the absorbent used to detect it had the power also of absorbing minute traces of the enrichers which had been put in; and these were recorded as carbon dioxide. He was at the present time trying to find out an absorbent which would be free from this objection, which attached to the use of sodic or potassic hydrate. With regard to Mr. West's remarks, there was not a gas manager in the kingdom who did not support him in his contention that gas should only be tested from the large distributing mains. The trouble always commenced with the distribution through the smaller pipes; and the diminution in illuminating power shown in the gas tested at the Guildhall Chambers was due to this cause. Mr. Livesey's observations were very important; and the reasons he gave for cheapening gas, by doing away with the extra 1½ candles, ought to be very carefully weighed. He (Professor Lewes) believed the effect of the competition of the electric light in the future would be to establish gas in an absolutely unassailable position as the fuel of the people; and anything which could be done to lower the price, and so hasten that day, would confer an immense benefit on the dwellers in large cities. In London, there were 6,000,000 tons of bituminous coal burned every year; and no matter how perfect the stoves were—and 99 per cent. of them were very bad—whenever fresh coal was put on, large quantities of smoke and oily matters were distilled out of it, and contaminated the air. It was the use of bituminous coal which made London fog what it was, and made it so lasting. The hydrocarbon vapours from the coal, by coating the little particles of mist, caused them to linger much longer than they would otherwise do. About forty years ago, Dr. Frankland made an experiment, which had not received sufficient attention. He took two evaporating basins, put into them equal weights of distilled water, and blew on the surface of one a small quantity of coal smoke. He then placed both under the same glass jar, in which there was some sulphuric acid to keep the air dry; and he found that the length of time taken to evaporate the water on which he had put a film of smoke was 80 per cent. greater than in the other case. A country mist was all dissipated by the sun by about eleven o'clock in the morning—but no eleven o'clock sun would get rid of a genuine London fog. When once formed, it was there to stay—sometimes two or three days. The more, therefore, the use of gaseous fuel was adopted, the nearer would be the time when London fogs would be cleansed and altered in character. Mr. Beilby remarked that gas of high candle power could be burned at a far greater pressure than common gas. This was quite true, and also that the flat-flame burner could be improved. But he doubted if one could ever get from it an amount of light which would come near that from an incandescent or a regenerative burner. In a flat flame there was a large portion at the base which was non-luminous; and this became less and less the richer the gas used. The light depended on the rate at which the flame was heated up to the temperature at which certain chemical interactions took place. The flame must be from 1000° to 1200° C. before it was properly luminous. The richer the gas was in hydrocarbons, the sooner would that point be reached; and this was why, with a rich gas, the non-luminous portion was smaller. Mr. Beilby spoke with some disrespect of the regenerative and incandescent burners; and he did not wonder at it, because rich gas, such as he was accustomed to in the North, was not suited to such burners. They had to be very carefully regulated indeed to prevent smoking. But though he should not recommend regenerative burners for Edinburgh, he should do so for London; especially as, if properly employed, they furnished the most effectual means of ventilation. Although incandescent lights were very beautiful, a room with a large number of people in it would have the air much purer with properly ventilated regenerative burners. He had been in Edinburgh several times, and had not been particularly struck with the illumination of the streets. The lighting at the end of Regent Street, or Parliament Street, where there was a large mass of lamps, produced a much finer effect than any he had seen in Edinburgh, though London gas was only 16 candles, while Edinburgh was 26 candles; and in those parts of Paris where gas was used on a large scale, the illuminating effect was as good as, if not better than in London, though the Paris gas was only 14 candles. As the illuminating power increased, the size of the burner had to be decreased; and burning rich gas in a small burner never gave so good an effect in open spaces as burning poorer gas in a large burner. Mr. Botley was quite right about the globes; but the public were, he thought, learning that lesson. It was not the public who required to be educated so much as the gas-fitter, in whose hands the householder practically was. But, as a rule, there was no one who knew less about coal gas, or the method of consuming it, than the fitter. A question had been asked why sulphur was not mentioned in the analyses. It was simply because the whole quantity present was so small that it would be impossible to represent it without going to about five places of decimals; and as few gas analyses were correct to one place, it would be simply waste of time. The sulphur in London gas was really brought down to a minimum.

The CHAIRMAN (Mr. J. N. Pimm), in proposing a hearty vote of thanks to Professor Lewes, said he believed that in the future gas would be used more for motive power and heating purposes than for lighting. He had an electric installation in his own house; but his gas bill was more than it used to be—gas being used as a means of producing electricity.

THE PREPAYMENT METER SYSTEM.

A Paper read by Mr. G. J. Gough before the South-West of England District Association of Gas Managers, April 17, 1894.

Two years ago, at the meeting of the Association at Bristol, I read a short paper upon the question of extending the supply of gas by the provision of fittings in small houses, in connection with the subject of short-period collections, or of prepayment by means of the prepayment meter then recently introduced. At that time my Directors were proposing to undertake the fitting up of small houses; but they had not yet entertained any idea of the prepayment meter. I then expressed the opinion that the prepayment system would not answer in small towns, such as Calne, and advocated a short-period collection in preference. I am afraid I had not given the question a sufficiently mature consideration; for the meeting was scarcely over when I began to realize that there was much to recommend the prepayment system to the class of householder which my Directors proposed to supply with fittings, and that my fears were not warranted. Instead, therefore, of returning home to put into practice a short-period collection (in my case meaning something shorter than a quarter, as we collect quarterly), I straightway opposed the idea, and advanced the prepayment system, which I am glad to say my Directors decided to adopt, with what results it will be the object of this paper to show.

A circular was issued early in July, 1892, stating, among other things, that "with a view to bring gas within reach of all persons and to promote its more general use in small houses, the Calne Gas and Coke Company, Limited, are prepared to lay on fittings for lighting two rooms, also for a boiling or frying stove, and to supply the stove and keep the whole in order, upon condition that a prepayment meter be used—charging only a small percentage upon the outlay, to be included in the price charged for the gas."

In response to this circular, some 30 applications were received. They were not all proceeded with immediately; it being considered advisable to advance cautiously, lest the system should prove unsatisfactory or unpopular. The first dozen "instalments" were completed in the following September, the remainder soon following; and we have now 50 houses so fitted up, and 20 more in hand.

There has been only the one circular issued; and no attempt whatever has been made to push the system. Its own merits, practically unadvocated on the part of the Company, have themselves secured its acceptance to the extent mentioned; and this fact is alone sufficient to prove the success of the scheme with the consumer. If my Directors desired to advance faster, I have no doubt whatever that, if actively sought for, another 50 householders might at once easily be found willing to have the instalments made; but my Directors prefer to let the system work its own way, as it is now doing, which is perhaps the better course to pursue.

Now as to our working experience. Taking the first page of the prepayment rental, which comprises 32 accounts, we find that the consumption of gas for the year ended at Lady-day last was 197,400 cubic feet; giving an average of 6168 cubic feet per consumer. These consumers all occupy houses at a rent of not exceeding £10 per annum—the majority at a rent of not more than £8 per annum. They include 3 labourers, whose wages do not exceed 15s. per week; 21 butchers, mechanics, and others of the artizan class, whose wages range from 18s. to 30s. per week; and 8 small shopkeepers.

If a comparison be made with 32 similar consumers, under the old system, taken at random from the rental, it will be found that the consumption for the same period was, in their case, 120,900 cubic feet, or an average of 3778 cubic feet per consumer only, as against the 197,400 and 6168 feet respectively—showing a consumption of 63·27 per cent. in favour of the prepayment consumer. I have carried the comparison into further detail, and find that the percentage of increase in the summer half was 96·45; and in the winter half, 41·5. The actual figures were: Summer half—Old system, 47,900 cubic feet, with an average of 1496 cubic feet; new system, 94,100 cubic feet, with an average of 2940 cubic feet. Winter half—Old system, 73,000 cubic feet, with an average of 2281 cubic feet; new system, 103,300 feet, with an average of 3228 feet. This large summer consumption

is a most satisfactory feature. It is no doubt to be attributed to the small boiling-rings, which, as before mentioned, are supplied in every instalment under the prepayment system; while they are not in general use under the old system. I may, however, parenthetically remark that we now supply these small boilers gratuitously to all consumers. The price charged for the gas under this new system is the same as to ordinary consumers, with a small addition, to provide a percentage on the outlay and to meet repairs and renewals. The cost of the instalments averages £3 9s. 4d.; and this includes pipes and fittings for sitting-room and kitchen (one pendant and one bracket), also the boiling-stove, a shelf for the stove, a 3-light meter, with shelf to carry it, and a meter-tap.

The price of gas at Calne was 3s. 9d. per 1000 cubic feet. The meters were adjusted to supply 17½ cubic feet for a penny, equal to 1000 cubic feet for 4s. 8d.; and this gives a margin of 11d. per 1000 cubic feet, which yields, with the consumption of 6168 feet per householder, 8 per cent. on the outlay. My Directors intended to adjust the price, so as to obtain a return of 10 per cent. upon the outlay beyond the profit on the gas sold. With the present consumption, and adjustment of the meters, the return is scarcely so much; but it is very near it. I should not recommend a reduction in the quantity supplied per penny, but rather that the consumer be given the benefit—remembering that he makes no bad debts, and that the collection is comparatively easy.

The system, then, has answered admirably in Calne; and the number of small houses supplied with gas has increased 24 per cent. Taking the whole 70 cases, our total number of consumers has been increased by 18·18 per cent.; the total consumption (assuming the average mentioned is maintained) is already increased by 5 per cent.; and the Company may take some credit for having provided a way of bringing the use of gas within reach of all classes, and, in so doing, are making a proper use of the monopoly which they possess of supplying this particular article of light.

We have not introduced the prepayment meter in connection with the old system. But we have used it in a few cases, where consumers like to keep their money as long as they can, and give you as much trouble as possible to get it, or will not let you get it at all; and we have found it particularly efficacious.

Private Bills in Parliament.—Proceedings in reference to two at all events of the few Private Bills that at one time appeared likely to lead to somewhat protracted investigation before Parliamentary Committees, have collapsed. All opposition to the Carshalton and Croydon and the Harrow and Stanmore Gas Bills has now been withdrawn; and the Bills will be dealt with as unopposed measures.

Lead-Poisoning.—A recent number of the *Zeitschrift für Hygiene* contained an account of an investigation into certain cases of lead-poisoning which had occurred in Calau, Germany. It was conducted by Herr Proskauer, who states that the water was of exceptional purity, as indicated by chemical analyses, and contained but about five germs per cubic centimetre. It was conveyed to the town in cast-iron pipes coated with asphalte composition; but the houses were supplied by means of lead pipes of considerable length. Two months after the water was turned on, there were two severe cases of lead-poisoning, and several slighter attacks. It was found on investigation that only those samples of water contained lead which had remained undisturbed in the pipes throughout the night; and the inhabitants were warned to allow at least 2½ gallons to run to waste before using the fittings in the morning. Examination by the calorimetric process with sulphuretted hydrogen, and analyses of the water supplied to 51 houses, indicated the presence of lead in quantities varying from a trace to 13 milligrammes per litre. The reason for the rapid absorption of the lead is said to be the exceptional richness of this water in free and partially combined carbonic acid, the low percentage of carbonates, and its extreme softness, combined with a large volume of air taken up during its flow through the mains.

Paris Gas Company.—According to the report of the Directors of this Company which was presented at the annual general meeting on the 24th ult., there was, as in the case of similar undertakings, a falling off in the consumption of gas during the year ending Dec. 31 last. The quantity sold reached 303,946,850 cubic metres, or about 10,730 million cubic feet; being 5,404,080 cubic metres, or about 190 million cubic feet, less than in 1892. Allowing, however, for the extra day in 1892, the decrease is brought down to 4,400,000 cubic metres, or about 155½ million cubic feet. The report sets forth the various causes for this great falling off; not an insignificant one being the increased use of Welsbach burners, about 100,000 of which, it is estimated, were in use in Paris at the close of the past year. There was, of course, a corresponding reduction in the receipts, which in the aggregate amounted to 78,009,633 frs., as compared with 79,540,685 frs. in 1892—a drop of 1,531,052. frs. This condition of things necessarily affected the share of the profits which goes to the Municipality. In the year 1892, this amounted to 11,600,000 frs.; whereas last year it came to 8,775,000 frs. only. With regard to the shareholders, their dividend is reduced from 72 frs. to 64 frs. per share of 250 frs., or 10 frs. 50 c. less than it was in 1891. These are the salient features of the report.

REGISTER OF PATENTS.

Distillation of Ammoniacal Liquor.—Spence, F. M. and D. D., and Gilchrist, J., of Manchester. No. 7485; April 12, 1893.

This invention consists in improvements in the form of the apparatus now sometimes used for the distillation of ammoniacal liquor, composed of a vertical iron still or column containing a series of horizontal iron shelves or diaphragms, placed at such a distance apart from each other as to leave ample steam and liquor way between them. In such apparatus, three sides of each shelf are joined to the walls of the column; the remaining side being left free, and kept at such a distance from the wall of the column as to afford a free passage way for steam and liquor. The liquor to undergo distillation—either heated beforehand by waste heat or without being previously heated—is introduced continuously at the top of the still, and falls from shelf to shelf till it finally passes out at the bottom of the still. The opening in any one shelf is always placed at the side of the column opposite to the opening in the shelf next to it; so as to compel the descending liquor and the ascending steam to traverse as great a distance as possible, and thus expose to each other the maximum amount of contra-current surface obtainable in a square column.

The present improvements consist: Firstly, in making the column oblong instead of square, so as to greatly increase the length of contra-current traverse between any two openings—oblong stills with shelves of the same superficial area as those of a square one giving a much longer contra-current traverse than one of the latter form. The advantages thus said to be secured are twofold: (1) By lengthening the total contra-current traverse, the more complete exhaustion of the descending liquor is made practicable by a given quantity of ascending steam; while at the same time stronger ammoniacal gas or vapour can be delivered at the gas-exit of the still, and in this way economize steam. (2) By lessening the width of the stratum of liquor passing along the diaphragms, it follows that the speed of its current is deepened and proportionately increased, and the tendency of the lime to silt and accumulate on the shelves or diaphragms used for lime liquor is lessened. In this way, the accelerated current, assisted only by the ebullition caused by giving off the ammonia gas, enables the patentees (so they say) to completely overcome the tendency to deposit lime upon these lime liquor diaphragms, and thus obviate the necessity either of the objectionable bubbling valves or openings in the diaphragms, or of the bulky sloping, curved, or other inclined surfaces now employed in so many stills to secure the constant suspension of the lime in the liquor. The only precautions necessary to secure this result are "the use of properly prepared milk of lime, and the previous thorough boiling off of the volatile salts of ammonia in the upper series of diaphragms described below." Secondly, in providing each shelf or diaphragm of the still with a lip at the end or edge next to the opening, for steam and liquor; and thus securing at all times a thin stratum of liquor over the whole surface of the shelf or diaphragm. Thirdly, in providing in each end of the column or still a series of manholes or openings large enough to admit of the free use of rakes or shovels for removing any pitchy or other matter which may be deposited upon the shelves or diaphragms; every manhole or opening being placed opposite the lip of a shelf or diaphragm, and thus enabling free access to be obtained, whenever requisite, to the upper surface of each shelf or diaphragm, and also to that of the shelf or diaphragm below it. Fourthly, in so constructing the still as to allow the boiling off in it of the ammonia both of the fixed and the volatile salts of ammonia present in the liquor.

In the still hitherto employed, the whole of the diaphragms or shelves are used to distil off the volatile salts of ammonia; and the boiled liquor passes from the bottom of the still into one of two horizontal stills, which work by turns in conjunction with the vertical still. When one of the two horizontal stills has received a charge of liquor, the cock supplying it is closed; a quantity of milk of lime sufficient to decompose the fixed salts of ammonia which the liquor contains is then introduced into it; steam is turned on to boil off the ammonia, and the now ammoniacal steam is passed into the bottom of the vertical still, to drive off the volatile salts of ammonia contained in the descending liquor, as already mentioned. While the charge of liquor in the horizontal still is being boiled, the liquor from the vertical still is being passed into the second horizontal one. When the second one has received its proper charge of liquor and its dose of milk of lime, and the charge of liquor in the first one has been sufficiently boiled, the steam is diverted from the first one into the second. The spent liquor of the first horizontal still is then rapidly discharged; its waste-pipe is next closed; liquor from the vertical still is again diverted into it; and so on. In the case of a still constructed according to the present invention, a number of the uppermost diaphragms or shelves only are employed to boil off the volatile salts of ammonia, and the remaining ones below them are used to distil off the ammonia of the fixed salts. In the case of the distillation of the ordinary ammoniacal liquor of gas-works, the patentees find it desirable to have two or three more diaphragms in the lower series than in the upper series; but the relative number will necessarily depend upon the proportions of volatile and fixed salts of ammonia present in the liquor. Some liquors contain scarcely any volatile ammonia; and some contain scarcely any fixed salts of ammonia.

The improvements further consist in providing the first of the lower series of diaphragms or shelves above with a considerably deeper lip than is given to any of the diaphragms or shelves above or below it. This ensures its holding at all times a considerable store of liquor. Above this diaphragm or shelf, the milk of lime is introduced; and its continuous mixture is secured with the body or store of descending liquor retained by the deep lip. As this store is large enough to contain a considerable quantity of lime liquor, and in working the still it is proposed to pump continuously into it a slight excess of lime liquor over the proportion theoretically required, the store tends to minimize the evil effects of any casual irregularities in the supply of lime liquor. Such irregularities would, if there were no store, allow portions of the fixed salts of ammonia at times to pass downwards and out of the still undecomposed. The mixed liquor passes over the deep lip of the store on to the several diaphragms or shelves below it, where it is practically

exhausted of its remaining ammonia by the upward current of steam, which it meets on its way to the bottom of the column or still.

Lastly, the invention consists in providing near the closed end of the highest of the upper diaphragms or shelves a vertical plate or lip, of such depth as will retain behind it sufficient liquor to immerse the mouth of the ammoniacal liquor supply-pipe; and thus protect it from the injurious action of the gases in the still, and also ensure the spreading of the liquor across the whole width of the diaphragm or shelf. The liquor to be distilled is introduced into the still in the usual way, either (*a*) from a supply-tank, placed at a sufficient elevation above it so as to give a column of liquor of higher pressure than that of the ammonia gas or vapour within and at the top of the still—such supply-tank being provided with the usual equalizing-box, with its ball-valve, to give a uniform head of liquor in the pipe which passes out of its bottom to the still; or (*b*) the liquor may be pumped either direct or through a heater into the still. The spent liquor is discharged from near the bottom of the still into the usual exit balance pipe, or in any other suitable way.

Gas-Engines.—Sintz, C., of Springfield, Ohio, U.S.A. No. 23,735; Dec. 9, 1893.

The object of this invention is to provide a gas-engine in which a high speed may be attained and maintained. Also to provide means whereby an explosion may be secured at each piston stroke; to provide a novel arrangement of the supply and exhaust ports in connection with the piston, whereby a substantially valveless engine is secured; and to provide a novel arrangement in the construction of the exploder or igniter.

The engine cylinder is provided with an annular water-chamber surrounding it in the usual way. The piston is arranged therein, and connected to the crank on the main shaft, which shaft preferably extends through the lower portion of the main-frame supporting the cylinder, and turns in suitable bearings therein. The piston is made of considerable length, and chambered out so that the connecting-rod is fixed thereto near the upper end or head. Extending through the walls of the piston thus formed is an opening or port. Arranged in the side of the cylinder, and opposite to this port, are exhaust and supply ports, which are opened and closed successively. They are never open to the cylinder at the same time; one or the other being constantly closed by the piston. The exhaust-port is adapted to open into the upper part of the cylinder, just before the piston reaches the limit of its downward stroke; the supply-port being adapted to communicate with the lower portion of the cylinder, when the piston reaches the limit of its upward stroke. On the opposite side of the cylinder, is a chamber formed in the walls of the cylinder, which communicates with the interior of it through "direct" and "indirect" supply-ports. One of these ports is adapted to communicate with the upper end of the cylinder and above the piston, as the piston reaches the limit of its downward stroke; while the port of the piston which opens directly to the explosive chamber through the walls of the piston, communicates with the "indirect" supply-port at the same time, and thus establishes communication from the lower end of the cylinder to the upper end as the piston reaches the limit of its downward stroke.

The base of the engine (which forms the main frame, and supports the cylinder) is preferably provided with a chamber, which encloses the crank, and which is completely closed by the side plates that support the bearings. This chamber preferably communicates directly with the lower end of the cylinder, which is left open for this purpose.

Arranged on the top of the piston, is a curved deflector, which extends about half-way around the piston, concentric with the periphery of the piston, and a slight distance therefrom; the deflector being turned outwardly at each end, so as to form radial projections, which approach in close proximity to the inner walls of the cylinder. This deflector stands opposite the "direct" supply port, when it is opened by the downward movement of the piston, and serves to deflect the air and gases admitted through the port to the cylinder, and causes them to rise upwardly and circulate around the top and sides of the cylinder when so admitted.

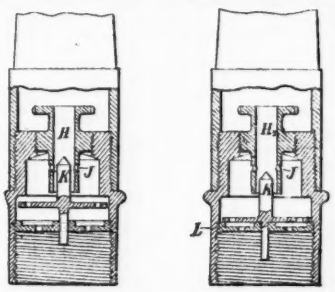
Regulators or Reducers for Gases, Liquids, &c.—Thompson, W. P.; communicated from H. L. Fuge, of Hanover. No. 24,406; Dec. 19, 1893.

The patentee remarks that pressure regulators or reducers as hitherto employed for gases, liquids, or steam under pressure working by means of a diaphragm, and which are fitted with a valve for admitting the gas—such valve being operated by the diaphragm, by means of levers or other mechanism—have the drawback that the valve itself, and the mechanism operating it, easily become oxidized, owing to the moisture contained in the gas or steam; and their effectiveness is thereby impaired. In order to remove this drawback, the diaphragm pressure-regulator which forms the subject of this invention is so arranged that the diaphragm itself forms the valve for the admission of the gas, steam, or liquid; so that the oxidation of the valve, and the interruption of working resulting therefrom, are entirely obviated. To permit this, the case of the regulator is arranged in such a way that the diaphragm is divided into two or more parts, one of which (in fact, always the larger part of the diaphragm) is invariably employed as the chamber of the pressure-regulator; and in this chamber the pressure of the gas or steam is reduced. The remaining smaller portion of the diaphragm is therefore able to be utilized for closing the inlet apertures, for the admission of the gas or steam. Several forms of this construction of regulator are shown in detail on the drawings accompanying the specification.

Governors for Gas-Burners.—Lake, H. H.; communicated from the Buffalo Gas-Saving Company, of Buffalo. No. 1678; Jan. 25, 1894.

The illustration shows a sectional elevation of the governor, with the valve in a raised position, as well as in its lowest position.

The cylindrical shell or casing of the governor is provided, in its lowest portion, with an internal screw-thread for attaching it to the gas-pipe, and at its upper end with an externally screw-threaded stem, for the attachment of the burner. The governor float or disc is arranged within the casing, and fitted sufficiently loose to permit it to rise and fall freely in the casing, in response to the fluctuations of gas pressure. There is a horizontal diaphragm arranged in the casing below the float, having a number of gas-passages; and the float is provided on its underside with a central guide-stem, which slides in an opening formed centrally in the diaphragm. An abrupt annular shoulder or offset is arranged above the float, at the junction of the body of the casing with its contracted hollow screw stem, and forming a valve-seat. The float is provided (opposite the shoulder or valve-seat) with a number of gas-ports, adapted to be restricted by the valve-seat, so as to reduce their area and diminish the supply of gas to the burner. The gas-ports of the float are so arranged with reference to the shoulder that, when the float is in contact with the latter, the gas-ports are only partly closed, so as to reduce the supply of gas to the burner, but not entirely shut it off. The shoulder also forms a stop, which limits the upward movement of the float, and so dispenses with a head or other stop device on the guide-stem of the float. H is a vertically adjustable sleeve, arranged in the tubular stem of the casing, and provided with an external screw thread, which engages with the internal thread of an opening formed in the closed upper end of the tubular stem. This adjustable sleeve is open at both ends, and is provided in its sides (near its lower end) with gas-ports J, whereby the interior of the sleeve communicates with the surrounding portion of the casing. K is an upright cylindrical stem or valve, projecting upward from the float, and entering the lower portion of the sleeve. The bore of the latter is somewhat larger than the valve, so



as to leave a narrow annular passage between the valve and the sleeve. The sleeve is provided at its upper end with a milled head, to lift or lower it with reference to the valve. L is a raised marginal flange or rim formed on the upper side of the diaphragm, whereby the float, when in its lowermost position, is held out of contact with the diaphragm, and prevented from adhering to it from any cause, and interfering with the operation of the governor. This flange also forms, with the upper side of the diaphragm, a shallow chamber or space, which allows the gas to pass from the portion of the casing below the diaphragm into the adjusting sleeve, when the pressure is so low as to permit the float to rest upon the flange of the diaphragm. When the gas is turned off, the governor float rests loosely upon the marginal flange of the diaphragm. Upon turning on the gas, the float is lifted to a greater or less extent, according to the pressure of the gas, causing the ports of the float to approach the shoulder or valve-seat, and thus governing the supply of gas to the burner. The fluctuations of the float cause the valve K to project into the adjustable sleeve H a greater or less distance, according to the pressure; thus allowing a corresponding quantity of gas to enter the sleeve through its side ports J, and pass to the burner. When the pressure rises, the float is lifted higher, causing the valve to project further into the sleeve, and reducing the supply to the burner; while when the pressure diminishes, the float descends, causing the valve to recede, and permitting an increased supply. In order to augment the supply, the sleeve is turned in the proper direction to raise it with reference to the valve; and when it is desired to reduce the supply, the sleeve is lowered.

APPLICATIONS FOR LETTERS PATENT.

6995.—Middlebrook, C., "Apparatus for receiving coin or an equivalent, and supplying gas in exchange." April 9.

7023.—Skene, R., "Gas and oil vapour engines." April 9.

7037.—Symmes, H. D., "Self-closing gas-burners." April 9.

7167.—Edwards, E., "Controlling apparatus for street-lamps." A communication from F. Otto and A. Peycke. April 10.

7194.—Beal, W., "Gas-burners." April 11.

7217.—Mellor, H. J. M., "Gas, petroleum, and like engines." April 11.

7221.—Webb, W. Le P., "Gas and oil motor engines." April 11.

7237.—Felt, W. O., "Manufacture of gas." April 11.

7284.—Fuller, W. J., "Burners of gas-stoves and grills." April 12

7294.—Farmer, J., "Gas and like engines." April 12.

7372.—Bernstein, M., and Silbermann, A., "Incandescent gas lighting." April 13.

7392.—Bernhardt, W., "Liquid-meters." April 13.

7402.—Tappenden, L. B., "Gas and electric light regulating apparatus for railway stations." April 13.

7408.—Batey, J., "Valves for use with steam, air, or gas under pressure." April 14.

7485.—Merryweather, J. C., and Jakeman, C. J. W., "Engines to be worked with gas or vapour, such as petroleum vapour." April 14.

The Electric Lighting Scheme of the Dublin Corporation.—At the meeting of the Dublin Corporation on Monday last week, the Electric Lighting Committee submitted a statement of income and expenditure for the twelve months ending Dec. 31 last; and it was stated, on the authority of the City Accountant, that, if the Corporation had been a private company, they would be able to pay a dividend of 4½ per cent.—a very satisfactory position for a new undertaking.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

A Method of Obtaining Small Consumers.

SIR,—In order to increase the number of our small consumers, we introduced, some four years ago, a monthly prompt-payment system, whereby the "deposit" obstacle was removed, and the risk of bad debts reduced to a minimum. The people who have availed themselves of this plan are precisely of the class which it is the object of the prepayment meter to reach—viz., tenants of weekly-rented houses small lock-up shops, &c. The condition of supply under this system is as follows: "Gas will be furnished at the net cash price for the time being without deposit or other security, upon condition that the account is paid on delivery, or within three days thereafter, failing which the supply will be discontinued without further notice." This condition appears at the head of the bill-form, and is strictly enforced. We provide and fix a meter and main tap.

The progress of the system can best be seen by consulting the figures scheduled below, which give the actual results of four years' working. It will be admitted that the steady increase in the number of consumers and the quantity of gas consumed is highly satisfactory; while the loss in bad debts—0·25d. per 1000 cubic feet sold—is, under the circumstances, comparatively small. With the exception of a few instances of transfer from the quarterly to the monthly arrangement, the 212 "monthlies" at present on the books—one-twentieth part of the total number of consumers—represent an actual gain of that number of gas users.

Year.	Quarter.	No. of Consumers.	Total Consumption in Thousands.		Increase per Cent. on Previous Corresponding Quarter.	Average Consumption per Meter.	
			Per Qr.	Per Ann.		Per Qr.	Per Ann.
1890	2nd	74	97		..	1310	
,,	3rd	103	219		..	2126	
,,	4th	107	307		..	2869	
1891	1st	115	294		..	2556	
				917			8,861
,,	2nd	130	177		82·5	1361	
,,	3rd	125	334		52·5	2672	
,,	4th	138	483		57·3	3500	
1892	1st	136	442		50·3	3250	
				1436			10,783
,,	2nd	143	237		33·9	1657	
,,	3rd	144	409		22·4	2840	
,,	4th	156	600		23·8	3846	
1893	1st	166	506		14·5	3048	
				1752			11,391
,,	2nd	176	345		45·5	1960	
,,	3rd	192	558		36·4	2906	
,,	4th	213	803		33·8	3770	
1894	1st	212	705		39·3	3325	
				2411			11,961
				6516			

Average annual consumption per meter (say), 12,000 cubic feet.
Bad debts, 0·25d. per 1000 cubic feet sold.

Estimated Capital Outlay.

18	2-light meters, at 20s.	£18
151	3-light ,, 25s.	189
23	5-light ,, 35s.	40
3	10-light ,, 55s.	8
195		..
17	not the property of the Company	..
212		£255
	Main taps, labour, &c. (say)	25
	Total	£280

Outlay per 1000 cubic feet of gas sold (1893-4), 2s. 3·8d.
Return in meter-rent, 13·5 p. c. per annum, or 3·8d. per 1000 cub. ft. sold.

It is questionable whether the "coin" meter can be economically introduced in districts where the working-class population is small, or is already fairly well supplied with gas. With us the "pay-as-you-go" meter is in the experimental stage. We have 40 of them in use; each installation costing, on an average, £2 15s. 6d. With each meter are supplied one kitchen pendant, one bracket, one small griller (or, at option, one ring burner), and 6 feet of rubber tubing. The pence are collected monthly. The collector is provided with a scale calculated at the inclusive price per 1000 cubic feet; *and no more cash is taken from the meter than pays for the registered quantity of gas consumed.* On his final visit each quarter, the collector hands back any balance that may be due to the consumer; the cash returned to the meter merely covering the value of the gas paid for, but unconsumed. With accurately-adjusted meters, however, the margin of error should be very slight.

Assuming the average annual consumption per "coin" meter to be 12,000 cubic feet—a high estimate—the outlay per 1000 cubic feet of gas sold is nearly twice as great as that expended on the monthly system, as will be seen from the following figures:—

One No. 2 light "coin" meter	£1	17	6
Set of fittings, labour, &c.	0	15	0
Total (say)	£2	12	6

Outlay per 1000 cubic feet sold: 4s. 4·5d.
Do. on the monthly system: 2s. 3·8d.

The foregoing particulars may be interesting and helpful to those who are contemplating the introduction of the "coin" meter, or who, unable to convince themselves of its adaptability to their district, are on the *qui vive* for an alternative scheme.

Scarborough, April 17, 1894. A. C. WILLIAMS.

Gas as a Fuel.

SIR,—With regard to the above important subject (to the discussion and free ventilation of which I believe your columns are open), I should like to make a few remarks respecting the utilization of gas as fuel, and the various interests therewith involved; and I trust you will not only afford me space, but will further discussion of the matter by inviting correspondence and opinions from some of your readers.

The adaptation of gas for fuel purposes in the "domestic" sense concerns four interests—(1) Gas companies; (2) inventors (including proprietors of gas appliances); (3) traders in gas appliances; (4) the public, as consumers and users of the appliances. As a suffering unit under the second heading, I desire to call attention to the unenviable position even a first-class gas appliance occupies unless one or the other of the following conditions obtains: Firstly, that it is included in the "hire-list" of gas companies; or, secondly, that sufficient capital is available to enable the appliance to be brought under public notice to such an extent as to render the gas companies' assistance unnecessary. Lacking either of these conditions, the appliance is practically "shelved," whatever its merits may be; and I contend that this cannot be beneficial to any of the four interests mentioned, but militates against the universal adoption of gas for fuel purposes.

It cannot, I think, be denied that this account of the state of affairs is correct, nor that the cause is due to the present position gas companies occupy as purveyors of appliances to the public, and this not in combination with the "trade" (who are the proper parties to act in this capacity), but as powerful competitors. So much so is this the fact, that the vast majority of the "trade" might just as well not exist so far as this legitimate branch of their business is concerned. By the nature and extent of this competition—opposed though it be to all pre-conceived ideas of "trade morality"—the consumer is placed on practically the same purchasing terms as are obtainable by the "trade" itself. In fact, the profits which legitimately belong to the "trade" are, through the gas companies, handed over to the retail customer.

The conditions of the four interests involved are, therefore, under existing circumstances, as follows:—

1. The gas companies do not benefit, as their trade in appliances is practically confined to the "hiring department;" and this, involving outlay of capital proportionate to the variety of patterns kept, is consequently restricted in its scope to those which have been in the market for years, and of which the companies hold large stocks. The adoption of any new principle or pattern by the gas companies (involving, as it does, fresh outlay) is, therefore, opposed to their financial interest. It is thus obvious that their position to the public cannot be that of impartial advisers, but simply that of *traders loaded with stock* which must be employed in such a way as to reimburse the capital sunk in its purchase. The paucity of patterns on "hire" diminishes the cost of the department; but it involves the loss of customers who would be attracted by more modern appliances constructed according to prevailing scientific opinions as to what constitutes a hygienic and efficient apparatus for the desired purpose.

2. Inventors, instead of being encouraged, are, under the circumstances, like Othello—without an occupation—in regard to gas appliances. Their expenditure of time and brains meets with no appreciation; and consequently their energies are naturally directed to more profitable channels.

3. The attitude of the "trade" may be described as that of a spectator only; for the few exceptions still endeavouring to do business in gas appliances (and thereby advancing or promoting the use of gas) have the manufacturer of the latter as their greatest enemy and competitor, instead of friend and ally.

4. The consumer, naturally patronizing what he can obtain on the easiest terms, confines himself to the presumably economical (?) and certainly convenient "hire system," and has to be contented with the restricted selection thereby entailed. The designation "consumer" represents already a vast section of the public, which would increase rapidly and illimitably, however, if offered gas appliances on improved principles.

I have endeavoured to point out the evil of the present state of affairs to the various interests concerned; and I now venture to suggest the remedy. First acknowledging that, as regards the "trade," this body may have been much to blame in the past, in that its lack of enterprise necessitated the gas companies, in self-defence, taking the matter into their own hands, it cannot be denied that the great resources of the latter have now accomplished an immense advance in the appreciation of gas as fuel by the public. Too much credit cannot, therefore, be given to them for their successful efforts. But having thoroughly introduced the wedge, surely they might now safely retire from their position as vendors of gas appliances—merely retaining their showrooms for exhibition purposes, and leaving the public to purchase from dealers. At the same time, they would, of course, continue the "hire system," with rates increased sufficiently not only to prove remunerative to themselves, but to some extent at least, to equalize the advantages of hiring as compared with buying, and so lessen the competition with the "trade." If this policy were adopted, there would be an incentive to inventors to improve appliances, and a great revival in the interest taken by the "trade," who would themselves then be able to maintain show-rooms, and effect business on remunerative lines in a department now closed to them.

These remarks are, of course, of a general kind; but the position of my own property is a practical instance and proof of the accuracy of my observations, in view of the following facts: My patents (known as "L. W. Leeds") constitute novelty in the application of gas fuel, the claims under same having been tested thoroughly several years ago, and officially certified by The Gaslight and Coke Company as eminently satisfactory. The principle moreover embodies exactly that which is described in the recent report of the *Lancet* Commission as being the *desideratum*, and therefore recommended for general adoption. Yet with all these advantages, and with a considerable expenditure of capital in endeavouring to bring them to public notice, the patents, lacking both the essential conditions I have mentioned, are so handicapped that the public interest suffers.

My case (which is the rule, and not the exception) is simply an individual instance; so that, for the sake of all parties concerned, I

should be glad to see your columns instrumental in changing the conditions of the gas interest as regards the appliances branch, and initiating a policy that would give fair play all round.

Beulah Hill, Norwood, S.E., April 19, 1894. ALFRED PULLAR, M.D.

The Yeadon Revolving Retort.

SIR,—In reference to the discussion on the Yeadon revolving retort at the meeting of Scottish gas managers reported in the JOURNAL for the 17th inst., it would be interesting to myself and a number of friends, who have been closely watching the development of this patent, to have a little clearer information from Mr. Nelson, if he will kindly give it.

First, he stated that, "in places where the Yeadon retort had been established, the managers had been so interested and so concerned about their coal supplies, that the Yeadon retort had not had that share of attention from them which it deserved." Will Mr. Nelson say at what places the retort has been established, and who are the managers to whom he refers as not having had time to attend to the Yeadon retorts established on their works?

Secondly, he stated that, "at Ripon, any difficulties there had been in relation to the production of gas by the Yeadon retort had arisen in the management of it." I am informed, on reliable authority, that, during the whole period the retort has been at Ripon, both the working and management of it have been in the hands of the patentee and his men absolutely. Does Mr. Nelson blame the patentee for the difficulties in managing his own machine?

Thirdly, he stated that in the previous week "he was at Leeds for four days and four nights," and the results were satisfactory; and also that, "during those four days and four nights, there was not a trace of carbon in the retort." Will Mr. Nelson give the exact dates of these "four days and four nights," the place where the tests were made, the particulars of such tests, and say who made them? He also stated that the total cost of the gas delivered into the holder (inclusive of material) is only 6½d. per 1000 cubic feet (by the Yeadon retort); that the production of gas is increased by 2500 cubic feet per ton of coal used; and that the illuminating power of the gas is also raised by 4 to 6 candles.

These results are marvellous; and I trust Mr. Nelson will give the information I ask for, so as to have his statements confirmed by those practical gas managers who have the retorts already established on their works, and also in order that we may obtain more information, if required, to enable us to ask our directors to give us their authority to put in the apparatus.

April 19, 1894. GAS MANAGER.

The Working of the Prepayment Meter System.

SIR,—I shall be obliged if you will allow me, through the medium of the JOURNAL, to ask those of my brother managers who have adopted the system of supplying gas through prepayment meters if they will communicate to you their experience of its working. My object is this: I have proposed to the Town Council a scheme for fitting up cottage property, and supplying it with gas through prepayment meters; the money paid to cover the entire cost of gas, meter-rent, and interest on the outlay for fittings, &c. I am convinced the scheme would work out to the satisfaction of all parties, and prove of great benefit; but there are others who do not think it will be a financial success.

Stratford-upon-Avon, April 16, 1894. J. S. CRANMER.

The Storeage of Coal under Cover.

SIR,—I should like to hear the opinion of gas engineers as to the deterioration, for gas-making purposes, of coal stored under cover in very fairly closed sheds. In Mr. Newbigging's "Handbook," he gives the deterioration on exposure to the weather; and I do not think there can be two opinions as to the correctness of it. My own experience, however, is that coal may be stored under cover for six or even nine months, and yet suffer no material deterioration, as far as gas making is concerned. This is a very important question just now, as gas companies are making contracts, and contemplating getting their supply of coal for next winter; and it is one which ought to be well discussed. Even supposing there is deterioration to the extent of (say) 5 per cent. or more, it is a question if it is not fully compensated for by the safety from risks of strikes and stoppages which will very probably occur in the coming winter. At any rate, the expression of the opinions of the engineers who have had large experience in the storeage of coal will do a great deal of good.

April 16, 1894. ENGINEER.

The Hermite Process at Worthing.

SIR,—As you have given publicity to Dr. Kelly's adverse report on the above, and have thereby helped to spread the erroneous impression that the trials made at Worthing were a failure, permit us to point out that this was not so, and that we feel sure the samples submitted to Drs. Klein and Dupré were not fair samples of the treated sewage, and that our view was supported by several members of the Worthing Town Council at their meeting on Tuesday, the 3rd inst. As a consequence of this feeling, the Council decided to consider the report as confidential, and not to publish it or adopt it until it was confirmed by the investigations now being undertaken by the British Institute of Preventive Medicine. But, unfortunately, Dr. Kelly had, on his own responsibility, allowed a large number of copies of the report to be distributed throughout the country.

Dalston, N.E., April 17, 1894. PATERSON AND COOPER.

South Devonshire Gaslight and Coke Company, Limited.—A Company has been registered under this title with a capital of £10,000, in £1 shares, to enter into an agreement with Mr. F. V. Thomas, and to carry on the business of a gas company.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress has been made with Bills:—

Bill read a second time and committed: Alloa Water Bill.

Bills referred to Select Committees—

Consett Water Bill, to the Committee on the Pontypridd and other Bills.

Edinburgh and Leith Corporations Gas Bill, Falkirk Corporation Gas Bill, and Falkirk and District Gas Bill, to a Select Committee consisting of Earl Jersey (Chairman), Earl Russell, Viscount Powerscourt, Lord Zouch of Haryngworth, and Lord Hawkesbury, to meet on Tuesday, April 24.

Bill reported, with amendments: Swinton Local Board Bill.

Opposition withdrawn: Aberdare Local Board Water Bill, Bacup Corporation Water Bill, Pontypridd Water (Tramroad) Bill, Swindon Water Bill.

HOUSE OF COMMONS.

The following progress has been made with Bills:—

Bills presented and read the first time: Electric Lighting Provisional Orders Bill, No. 1 (Barrow-in-Furness, Buxton, Chipping Wycombe, Chesterfield, St. Helens, and West Hartlepool Orders), Electric Lighting Provisional Orders Bill, No. 2 (Grimsby, Harrow, Leyton, Monmouth, Peterborough, and St. Austell Orders).

Bills read a second time and committed: Ambleside District Gas and Water Bill, Preston Gas Bill.

Bills reported: Fulwood Local Board (Water) Bill, Paignton Gas Bill, Southend Water Bill.

Bill read the third time and passed: South Hants Water Bill.

Petition presented: From Clerkenwell, for inquiry into the working of the Metropolitan Gas Companies.

Petition withdrawn: From the Croydon Corporation, against the Carshalton and Croydon Gas Bill.

Electrical Pumping Plant for the Worcester Water-Works.—At the meeting of the Worcester City Council last Friday week, the Water Committee recommended the rescinding of a resolution passed last year, to erect at the water-works a small pair of Tangye engines and pumps, estimated to cost £910, and two Galloway steel boilers estimated to cost £1050. In lieu thereof they proposed the acceptance of the tender of the Brush Electrical Engineering Company, Limited, to supply and fix two sets of electrical pumping plant, consisting of two alternating-current motors of 30-brake horse power (an efficiency in the motors of 90 per cent. to be guaranteed), and two three-throw pumps capable of delivering 10,000 gallons per hour to an elevation of 300 feet through 5000 yards of 10-inch main, at an estimated cost of £1128, and also to lay an electricity main capable of conveying a current sufficient to drive the motors and light 1000 lamps *en route* from Castle Street (where the main already provided for will terminate) to the water-works, at an estimated outlay of £961—making a total cost of £2089. The recommendations were adopted.

Odessa Water Company, Limited.—The report of the Directors of this Company for the year ended Dec. 31 last states that the water-rents amounted to £53,787, and the miscellaneous receipts to £4076; leaving a balance, after meeting interest on debentures and all charges, including drawn bonds, of £11,649, against £9087 for 1892. This balance includes the difference on exchange of £1056. The Commission of the Douma have intimated to Mr. Platts that they are prepared to recommend to the Douma that the works should be acquired by the payment of an annuity for the remainder of the concession, equal to the net revenue for the year. The course suggested has been adopted by the City of St. Petersburg under analogous circumstances, which it is assumed has been taken as a precedent. Before making this recommendation, however, the Commission have requested that Mr. Platts should be furnished with a power of attorney to negotiate with them, giving him authority to arrange matters of detail before making their report to the Douma; and also that such details may be in a form which can be presented to the shareholders for confirmation at a meeting to be convened for the purpose. These details will, of course, include the price payable for meters, stores, &c., and for the collection of outstanding water-rents.

South African Lighting Association, Limited.—In the report to be presented by the Directors of this Company to the proprietors at the fifth ordinary general meeting next Tuesday, they express their satisfaction at recording the continued prosperity of the Association during the year ending Dec. 31 last. In August, the Directors were enabled to reduce the price of gas by 7½ per cent. to private consumers, and to a greater extent to the users of gas-engines; and the gas sold shows an increased consumption to the extent of 20 per cent. over the year 1892. In the final profits, consequently, there is the substantial increase of £560 over the preceding year. In October last, 1000 new shares were issued, and readily taken up by the proprietors; and on these £2 per share has been paid. The Directors contemplate an issue of £5000 additional debentures, which, with the uncalled capital, will be required for the completion of the Grahamstown works. These have made considerable progress. The whole of the plant has been shipped; the buildings are approaching completion; and the Directors hope that the works will be in operation before the end of the year. The available balance on the profit and loss account is £7062, which the Directors recommend should be dealt with by confirming the transfer to the reserve account of £1500, raising that account to £4500; transferring £500 to plant depreciation account; the payment of the usual dividend of 8 per cent. for the year, with a bonus of 2 per cent., less the interim dividend of 2½ per cent. paid last October; and after payment of the bonus to the officials at Port Elizabeth, amounting to £534 17s. 6d., carrying forward the balance remaining—viz., £2243.

MISCELLANEOUS NEWS.

METROPOLIS GAS SUPPLY.

The Quality of the Gas in the Past Quarter.

The following is an abstract of the report of the Chief Gas Examiner for the Metropolis (Dr. A. W. Williamson, F.R.S.) as to the quality of the gas supplied by The Gaslight and Coke, Commercial, and South Metropolitan Companies, during the quarter ending the 31st ult.:—

I. *With respect to Illuminating Power.*—The average illuminating power, in standard sperm candles, at each of the testing-stations, was as follows:—

The Gaslight and Coke Company—	
Fenchurch Street, E.C.	16·5
Kinghorn Street, E.C.	16·3
Dorset Buildings, E.C.	16·7
Ladbroke Grove, W.	16·4
Devon's Road, E.	16·3
Carlyle Square, Chelsea, S.W.	16·2
Camden Street, N.W.	16·3
George Street, N.W.	16·2
Graham Road, E.	16·7
Kingsland Road, E.	16·3
Spring Gardens, S.W.	16·2
Grove Gardens, St. John's Wood, N.W.	16·3
Hornsey Road, N.	16·3
Lambeth Road, S.E.	16·1
Millbank Street, S.W.	16·2
Commercial Gas Company—	
Parnell Road, E.	16·2
Wellclose Square, E.	16·3
South Metropolitan Gas Company—	
Hill Street, S.E.	16·7
Bedford Road, S.W.	16·3
Stoney Lane, S.E.	16·4
Lewisham Road, S.E.	16·3
Blackfriars Road, S.E.	16·4
Burrage Road, S.E.	16·3

It will be seen, from these results, that the average illuminating power at all the testing-stations of the three Gas Companies has been higher than the parliamentary standard. At the Dorset Buildings and Graham Road stations of The Gaslight and Coke Company, the minimum was higher than the standard. Returns of deficiencies in the lighting power of the gas were made by the official examiners at the Fenchurch Street, Kinghorn Street, Spring Gardens, Hornsey Road, Wellclose Square, Blackfriars Road, and Burrage Road stations. At all the other testing-places, the illuminating power of the gas, even when weakest, was equal to the requirements.

II. *As regards Purity.*—Sulphuretted hydrogen was not present in the gas at any of the testing-stations. The average amount of sulphur in the gas at all the testing-places of the three Companies was considerably less than the quantity permitted, more especially in that made by the Commercial Gas Company. At the Bedford Road station of the South Metropolitan Gas Company, a slight excess was reported on the 30th of March. With this one exception, the maximum was in every case within the limit. Ammonia was generally present in the gas, more or less frequently during the quarter, but only in slight quantities, at all the stations. No excess was returned on any occasion.

The Price and Quality of the Chartered Company's Gas.

Last Wednesday, a well-attended public meeting was held in the Holborn Town Hall, to protest against the price charged by The Gaslight and Coke Company for the gas supplied by them in their district north of the Thames. It was convened by the Holborn District Board of Works, at the request of a number of ratepayers and inhabitants. Sir A. Rollit, M.P., presided. In the course of his remarks, he stated that the price of gas was 30 per cent. higher now than it used to be; while the streak of the Thames made a difference of 8d. per 1000 cubic feet. Unless this could be fully and completely accounted for, it was a just cause of complaint. The public lamps were supplied with gas at 2s. 2d. per 1000 cubic feet. The Company on the south of the Thames paid dividends of 13 per cent., although their gas was so much cheaper. The Gaslight and Coke Company were paying 12 per cent.; so that if there were lower charges on the other side of the water, there were higher dividends. Mr. H. C. Richards moved—"That, in the opinion of this meeting, the difference of 8d. in the price of gas made by The Gaslight and Coke Company—viz., 3s. 1d. to consumers on this side of the river, and 2s. 5d. to consumers on the other side—which has existed since 1892, is unfair and excessive." Mr. J. Rowlands, M.P., seconded the motion. He said if the contention of the Company, that it was necessary to charge a higher price for gas owing to higher wages paid to, and shorter hours worked by, the carbonizers in their employ, could be maintained, he would not have another word to say on the matter. But this was not so; and he was informed that the Commercial Gas Company paid better wages. If The Gaslight and Coke Company could not see their way to make fair and proper charges, Parliament must be asked to review the position, and to deal with the question as to whether the circumstances of to-day were the same as they were when privileges were originally granted to the Company. The resolution was adopted; and it was further declared that an alteration in the law was desirable, with a view of compelling the Gas Companies to charge a fair and uniform rate throughout the whole of London.

In the House of Commons last Thursday, Mr. J. Rowlands asked the First Commissioner of Works whether he could state what amount of gas was consumed in the various Government Departments under the control of the Board of Works during the past year, and what was its total cost; whether the gas supplied by The Gaslight and Coke Company at 3s. 1d. per 1000 cubic feet is of the same quality as the gas for which they are charging 2s. 5d. per 1000 cubic feet on the south side of Vauxhall Bridge; and whether cannel gas is supplied to the Government Departments, and, if not, when it was discontinued. Mr. Herbert Gladstone, in reply, said the quantity might approximately be taken at 150,000 million cubic feet, of which about 143 millions were supplied by the Company named. The total cost was £22,717, exclusive of meter-rents. The whole of the gas now paid for by the Office of Works was described as "common" gas; and as the illuminating power was subject to the Board of Trade test, he had no doubt the quality in the north and south of London was the same. He found that the supply of cannel gas to the public departments was discontinued in September, 1892.

The Lighting of Common Stairs.

The Select Committee appointed to consider the General Powers Bill of the London County Council, which contains a clause relating to the lighting of common staircases, sat for the first time last Tuesday, under the presidency of Mr. Coddington; and this matter was discussed at some length. Mr. Pope, on behalf of the promoters, explained that the Bill provided that the owner of any building designed for use in flats or tenements, of which any staircase or passage, used in common by the occupants, was open to the street or to a public place at night, should be bound to light the staircase or passage from sunset to sunrise to the satisfaction of the parish lighting authority, who might prescribe the amount and position of the light. A penalty not exceeding £5 was provided for non-compliance with an order of the authority. The obligation to light the staircase or passage could be avoided by placing an iron gate at the entrance and keeping it locked at night. Many of the tenement buildings occupied by the working classes had, he said, open access to the public street; and it was found that the dark recesses were the cause of much annoyance. The County Council simply desired that these passages and staircases should be treated as part of the public street. The Council were not themselves the lighting authority; but they had included the clause in their Bill in order to save the Vestries the trouble of each bringing in a separate Bill to effect this purpose. The Chairman called attention to the fact that the Local Government Board had reported that it was undesirable that clauses having no reference to the powers of the Council should have a place in the Bill. Mr. Pope pointed out that the clause was purely for the assistance of the Vestries; and Parliament had previously sanctioned this procedure to prevent multiplicity of Bills. Mr. Rickards, on behalf of the Strand District Board of Works, said that he had no objection to the provisions, if discretion were left to a local authority to order the lighting of the staircases or not, as they thought fit; and he submitted an amendment giving this discretion. A joint petition against the clause was lodged by the Trustees of the Peabody Donation Fund, the Improved Industrial Dwellings Company, Limited, the Metropolitan Association for Improving the Dwellings of the Industrial Classes, and other associations and persons, being owners of tenement dwellings of the poor of London; and Mr. Claude Baggallay, appeared in support thereof. Evidence in favour of the clause having been given, representatives of the opposing petitioners were heard; and the proceedings were adjourned till Thursday. On the resumption of the inquiry, Mr. J. Wigmore and Mr. A. Sturgeon, officers of the Improved Industrial Dwellings Company, were examined. The former stated that he had not received any complaints from tenants with regard to the absence of all-night lighting in the staircases; and his opinion was that, in order to deter tramps and disreputable persons from haunting these places at night, it would be better not to light the staircases after eleven o'clock. Mr. Sturgeon quoted the opinion of a District Superintendent to the effect that the lighting would tend to attract idle persons; and that offences were generally committed when the staircases were lighted. He was opposed to the suggestion. Several tenants of industrial dwellings from the Bethnal Green district were called to bear out the view that all-night lighting would be a great nuisance, and cause the staircases to become the resort of idle persons. Mr. Baggallay addressing the Committee on the principle involved, urged that the clause was one which made a very serious change in the general law of the country, as it endeavoured to impose a new condition between landlord and tenant. If it was desirable to make such an alteration, it ought to be done by general legislation, and not by means of a clause introduced in a Private Bill. Mr. Rickards having addressed the Committee on behalf of the Strand District Board of Works, Mr. Worsley Taylor replied for the London County Council. He urged that the principle had already been sanctioned by Parliament. Several of the tenement owners had voluntarily lighted their staircases at the suggestion of the Vestry; and therefore the cost could not be prohibitive. It was idle to contend, as the petitioners' witnesses did, that it was actually better for general convenience and decency that the staircases should be left in darkness. After consideration, the Committee decided to pass so much of the preamble of the Bill as related to the lighting of staircases, but subject to alterations to be made—(1) apportioning the expense of additional lighting between the owner and the local authority; and (2) leaving to the Vestries the discretion to order the lighting or not. In answer to Mr. Baggallay, the Chairman said the Committee were of opinion that the local authority should bear at least half the additional expense of the gas; and they understood from the representatives of the County Council that the authorities would assist in putting up the extra lights. They suggested also that the penalty of £5 for non-compliance with a lighting order from the Vestry should be reduced to 40s.

SAN PAULO GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Friday, at Winchester House, Old Broad Street, E.C.—Mr. F. DELMAR, F.S.A., in the chair.

The MANAGING-DIRECTOR and SECRETARY (Mr. J. Heath) read the notice convening the meeting; and the report and accounts, which were referred to in the JOURNAL last week, were then submitted.

The CHAIRMAN said he was pleased, and he hoped the shareholders were, to find that the position and prospects of the Company had improved since they last met, and were still improving, and that they

were enabled to pay a dividend at the rate of 6 per cent. per annum, in place of 5 per cent. in the previous half year, besides strengthening the reserve account. Taking a retrospective glance at some of the most important items in the accounts, it would be found that in the second half of 1892 5698 tons of coal were used; and the consumption of gas was 60,959,000 cubic feet. In the second half of last year, 6660 tons of coal were carbonized; and the consumption of gas was 73,073,000 cubic feet. The receipts from the public and private lighting in 1892 amounted to £39,113, and for coke and tar to £4005; the corresponding figures for 1893 being respectively £38,390 and £4832. The difference between these figures would no doubt cause the shareholders some astonishment; but the reduction in the receipts arose from the rate of exchange in 1893. In spite of this, however, the business went on increasing; and when this damaging influence of the rate of exchange disappeared, and with the extended works prepared to meet the growing demands upon them, his impression was (and he thought he was not saying more than circumstances justified) that the Company would regain what the depressing rate had deprived them of. They had almost recovered from the serious costs of demurrage—rescued by a mode of chartering vessels, and the more favourable facilities for landing cargoes. The Directors were gratified to learn that, although the price of gas supplied to private consumers had been raised on some occasions, nevertheless they spoke well of the Company. The authorities, too, showed a friendly and enterprising spirit towards them; and moreover both the public and private lighting was paid for with promptitude. Their Engineer (Mr. Phillips) had recently visited the works, and reported them as being in excellent working condition; and he had made suggestions which would be favourable to the revenue in various ways. The Chairman proceeded to make a brief comparison of electric and gas lighting; and with regard to the question of cost, he quoted a 'practical authority" on the subject to the effect that taking electricity at 7d., or a fraction more, per Board of Trade unit, it cost about one-third more than gas. In conclusion, he said that, with an improvement in the rate of exchange, he believed the Company's prospects were very favourable; and he had therefore much pleasure in moving the adoption of the report and accounts.

Dr. E. BATT seconded the motion.

Mr. ROBBINS remarked that on a previous occasion he had spoken somewhat adversely regarding the report; but, considering the enormous difficulties the Directors had had to contend with of late, the present report was, on the whole, satisfactory. He noticed that it was now proposed to place £3000 to reserve account. At a former meeting, they were told that there was a large reserve; but it was all mixed up in the accounts, and was not available for the purpose for which it was required. He would therefore suggest that this £3000 should be put to a separate account and invested. They were not "out of the wood" yet. In the present accounts, the rate of exchange had been taken at $10\frac{7}{8}$; but since they were made up, the rate had been down to $9\frac{3}{16}$, and was now about $9\frac{1}{4}$. Consequently the current half year would come out much more adversely than the past six months. He should like to know what the Directors intended doing with the £3000 he had referred to.

Mr. HEATH replied that it was a matter of account; and the money was really invested in the Company's business. Mr. Robbins, however, had evidently overlooked the fact that they had nearly £20,000 invested in English railway debentures. Answering a further question, he said they had spent £241,000 out of a capital of £250,000; so that they had only £9000 left for working capital.

Mr. PLUMB explained that the Company had £19,259 invested as a reserve; and the £3000 could also be invested, if it was thought better to dispose of it in that way.

Mr. CROSS observed that there was no enterprise in Brazil that had come out of the past year with the results that they had done; and he thought this was largely due to the good terms which appeared to exist between the Company and the people of San Paulo.

Mr. HEATH, replying to a further question, stated that the price of gas at present worked out to about 11s. 6d. per 1000 cubic feet; and that was under the contract price.

The motion was carried unanimously.

Resolutions were next passed declaring a dividend at the rate of 6 per cent. per annum; re-electing Mr. Delmar a member of the Board; and re-appointing the Auditor (Mr. W. Cash, F.C.A.).

The proceedings then terminated.

The Guiseley Local Board and the Water Company's Undertaking.—The shareholders of the Guiseley Water Company have decided to accept, subject to the approval of the Local Government Board, the offer of the Guiseley Local Board of £1 per share for the purchase of the Company's plant and works.

Fylde Water Company.—The report and accounts of this Company for the past half year show that the capital account has been increased by the expenditure of £5279; and, with £17,882 transferred from the Calder River property and arbitration account, it now amounts to £345,473. The water receipts aggregate £14,582; and, after deduction of interest, sinking fund, working expenses, &c., there is a balance of £9507. Out of this the Directors recommend a dividend at the rate of 4 per cent. per annum on the preference stock of 1891, at the rate of 10 per cent. on the "A" stock, and 7 per cent. on the "B" stock—leaving a balance of about £1090 to be carried forward.

The Driffield Local Board and the Gas-Works.—At the meeting of the Driffield Local Board on Monday last week, a letter was read from the Local Government Board with reference to the proposed purchase of the gas-works by the Board. They pointed out that, as the Company did not possess parliamentary powers, the Local Board must obtain a Provisional Order; and it was too late to do so in the present session. They also recommended that a valuation of the undertaking should be made prior to the application for the Order. The Clerk, acting under instructions from the Chairman, had replied to the effect that the Company was registered under the Companies' Act, 1862; and asking if it would be necessary to obtain an Order, having regard to section 162 of the Public Health Act, 1875.

SOME NOTES FROM AMERICA.

From Our Own Correspondent.

Municipal lighting continues an absorbing question in many of the cities throughout the country; and while I do not wish to refer further in detail to all the prominent cases before me, I cannot refrain from noting the unfair way the subject is frequently treated. Take Grand Rapids, Michigan, a city of moderate size, which has a contract with the local Electric Light Company made for only three years. This contract was of such a nature that the Company were compelled to buy towers of a certain make for use in lighting the streets; and they were thus forced to make an extra expenditure of $38,000—an expense which could not be avoided or controlled under the terms of the contract, as this particular kind of tower was called for, and it was made by only one manufacturer. Yet the authorities can apparently see no reason why the price they pay for an arc light should be in excess of the figures given as the cost by municipalities owning their own plant.

Another way of figuring down the cost of a municipal lighting plant recently came to my attention. The city not only lights its own streets, but supplies private customers as well. In calculating the net results of the plant in question, credit is given for a certain number of arc lights used in lighting the streets at $110 a year, which is said to be a "reasonable" price; and that in the face of the assertion, so often made, that an arc light run by a municipality costs only $55 a year. This is but another instance of the unfairness shown by municipalities when treating with corporations.

On this point, the following figures on the expense of maintaining the Chicago municipal plant are of interest, as the alleged low cost of running this concern had been quoted the world over. As authoritative figures are of so much more value than vague generalities, I think it is worthy of reproduction in full. It is addressed to Chairman Smith, of Buffalo, and is as follows:—

During the year 1893, we operated 1110 2000-candle power arc lamps from four power stations. They cost as follows:—

Plant.	No. of Lamps.	Hours Operated.	Cost per Year.	Cost per Hour.
No. 1	350	3971	$94·36	$0·0244
No. 4	307	3925	89·05	0·0226
No. 6	354	4056	95·37	0·0235
No. 8	99	3987	132·78	0·0307

The cost per lamp per year for 1110 lamps was $96·64. The amount invested in these four plants up to date is $688,312·80, which includes land, building, conduits, circuits, lamps, posts, steam and electrical equipments, &c.; and it represents a land, building, steam, dynamo, conduit, and circuit capacity largely in excess of the present number of lamps operated. In the operating expenses for 1893, we do not include interest, depreciation, or taxes. During the latter part of the year, lamps operated from plant No. 8 were connected to, and are now operated from, plant No. 4; so the total cost per lamp per year should be less for 1894. In the current number of *Electrical Industries*, Monadnock Block, Chicago, Vol. V., No. 2, there is an article on our electric lighting system, which might be of use to you. The coal used is: Indiana block, $3·12 per ton; Indiana block screenings, $1·65 per ton; Hocking Valley nuts, $3·50 per ton.

(Signed) J. B. BARRETT, Superintendent.

The city of Buffalo has recently been investigating this subject, but has voted to postpone the matter.

Detroit (Mich.), which has been the seat of so many lighting fights, is again in hot water, this time over the awarding of the several contracts for its municipal electric light plant. There has been intense competition for all the equipments necessary for the work; and now that the contracts have been awarded, the unsuccessful bidders are very indignant, and desire that the matter shall be investigated. One party, who tendered for the arc lamps, complains that his lamp was not even removed from the packing-case. All this goes to prove that American cities had better not try to act as commercial corporations.

The Gas Company of Springfield (Ill.) are passing through all the unpleasantness of a gas-price agitation; and the daily papers of that place offer their readers some very spicy "news," such as is usually found in the every-day press when lighting matters are under discussion. As the Company also own the electric light works of the city, they have been open to attack at two points—the price of gas, and also that of electric light. On the latter question they are apparently to get the worst of it, as the city has voted to put up a municipal plant, notwithstanding that the Company offered to supply arc lights at $100 a year. The city seems somewhat in doubt as to how to reach the Company on the matter of the price of gas, as it does not want to put up a municipal gas plant, because gas will, in a few more years, be a "back number;" and they do not wish to invest money in a concern which will be of no use a short time hence—at least, that is the reason given. The Gas Company promise to supply gas at $1·20, which is as low as any city in the State; but this does not meet the views of the members of the City Government, who insist that the price shall be about 50c. to 75c. The newspapers state that, if the Company do not accept this figure, the city should pass an order compelling them to remove their pipes from the streets. Was ever unreasonableness carried nearer the verge of Socialism? Here is a Company offering to supply gas as cheaply as any town in the State—including the large city of Chicago—and yet their property is to be removed, if the newspapers have their way, because they will not cut this figure in two.

The city of Philadelphia is still investigating its gas supply; but what phase of the question they are now supposed to be looking into—as one of the papers puts it—is a query to which no one seems able to supply the answer. The Gas Committee continue to have "experts," capitalists, and inventors of gas processes before them; and at each is thrown the question, "What should be done to put the gas-works in first-class shape?" If the works were being run by a private company, it seems quite likely this question would be handed over to the engineer for thorough investigation and exhaustive report; and it is certain they would obtain valuable information. But there is no reason for holding that they are getting any value out of the present investigation. A proposition has been made to have the city of Philadelphia purchase the Northern Liberties Gas Company; but the

government have decided that they do not want any more gas-works. On the other hand, they are agitating the question of putting up a municipal electric light plant; but some of the daily papers very properly take the ground that, as the city did not go into this business in 1883 when it had the right to do so, but encouraged private citizens to invest their capital in such enterprises in order to supply the city's needs, it is only right that, if it now decides to add this branch to its lighting business, it should buy out the established companies, and not ruin them by building an opposition plant. The *Philadelphia Press* says: "A score of English cities run such plants (electric light plants) by using the garbage and droppings collected from the houses as fuel, so that the expenditure for coal is reduced to one-third what it is without the garbage to burn." Where are the score of cities?

One of the first towns in Massachusetts to accept the Municipal Lighting Act and erect an electric plant, was the town of Braintree; and the report of the department published a year ago, which covered a few months' operation of the plant, was a thorn in the side of many lighting companies, as it stated that the cost of an arc light was at the yearly rate of $35. As many companies were obtaining three to four times that sum, it was quite difficult to explain matters. Now we have the second report, and note that the operations of the plant have not been as successful as was expected, as the profits would not take care of the interest on bonds and sinking fund; but it is hoped that increased patronage during the coming year will lead to better results.

Gas matters in Chicago are getting quite interesting. In the first place, we are told of a new gas process there shown experimentally, the chief peculiarity of which is that the retorts not only make gas to fill the holders, but also to heat the retorts as well; and thus, after the plant is once started, there is no further expense for material except the water bill. This sort of thing naturally excites the public mind, at a time when attempts are being made to reduce the price of gas in that city. The present rate is $1·15 (recently reduced from $1·20); and a Company are trying to obtain the right to open the streets and enter into competition with the established Companies, agreeing to supply gas at $1. On this petition the fight is now being waged.

Dollar gas has long been the looked-for haven of rest of the gas man. He has felt that, if he could reach that point, the public would be satisfied, and all the ills of official life would pass away. How rudely is this dream shaken by the following quotation from the *Chicago Tribune*: "There should be no listening to the song of the dollar-gas sirens." The objective figure now seems to be 75c.

Among the interesting subjects discussed at the recent meeting of the New England Gas Association, was the matter of electrolysis. The West-end Road of Boston, which controls practically all the street-cars of that city, has, over portions of its lines, connected the rails with overhead return wires, which has mitigated the evil effects upon gas and water pipes. The meeting had, as a guest, Mr. Farnham, the Electrician to the New England Telephone Company; and he spoke at length on the subject—showing how seriously the underground cables of his Company had been affected by the return currents of the street railways. He narrated the experiments which the Company had made, to determine if the corrosion of their underground cables was really due to electrolysis. He stated that this fact was proven; and reminded the members that the evil occurred when the current passed from the pipe or cable into the moist earth.

Among the interesting papers read at this meeting, was one by Mr. Gifford, on "Lime-Boxes for Removing Carbonic Acid." The writer has a plant of six purifiers. Four of these are operated by a centre-seal, and are filled with iron sponge; and the remaining two are worked by independent valves, and are filled with lime. The gas made is a mixture of coal and water gas. The lime is made from oyster-shells; and the following is an analysis of it:—

	Per Cent.
Moisture	29·36
Carbon dioxide	4·73
Combined lime	6·70
Insoluble residue	1·82
Available lime	57·39
	100·00

An analysis of the spent lime showed—

	Per Cent.
Moisture	21·20
Carbon dioxide	26·18
Combined lime	33·32
Insoluble residue	2·22
Available lime	17·08
	100·00

The gas at the entrance of the lime-boxes contained 5 per cent. of carbon dioxide, and at the outlet 2 per cent., from which he figures that there were 15 cubic feet of carbon dioxide taken from each 1000 feet of gas passed, and 128 cubic feet of the same product removed per bushel of lime. The author figures on 31·57 lbs. available lime per bushel, and hence a lost efficiency of 3·07 lbs., or 24 cubic feet, of carbon dioxide per bushel of lime. On testing to ascertain the loss of candle power from the presence of the carbon dioxide in the gas, the writer found 2 per cent. of this impurity knocked down the luminosity about 16 per cent. This is certainly a high figure—higher than that reached by other experimenters. Whether it will pay better to put back this luminosity or to remove the carbon dioxide at the outlet, is a point which must be determined by local circumstances—such as the cost of lime and of enriching material. One speaker, in discussing the matter, said he found it required an extra half-gallon of naphtha in his water-gas plant to keep up the candle power, if lime was not used.

The Commissioners appointed to value the plant of the Wakefield Gas and Electric Light Company, have made their award. The figure is $154,000. The case has been referred to in several of my letters; and it is of interest as being the first instance under the Municipal Lighting Act where a city or town has applied to have the value of the lighting company's plant established. The figure asked by the Company was $250,000.

THE COMPETING GAS SUPPLY FOR NEW YORK CITY.

The New Works of the East River Gas Company.

Reference has already been made in the JOURNAL to the project initiated by the East River Gas Company—ah undertaking supplying gas in Long Island City—for sending gas from their works at Ravenswood into New York City, by means of pipes laid in a tunnel under the river. A considerable portion of a recent number of *Progressive Age* was devoted to an illustrated description of the works, furnished by the Company's Engineer (Mr. D. L. Hough); and the following particulars are extracted therefrom.

Before describing the works, it may be of interest to give some account of the Company who are erecting them, and of the President—Mr. Emerson M'Millin. The legislative franchise for undertaking business in New York was obtained by the Company in April, 1892. In the following month, work was commenced on the tunnel; and in October of that year ground was broken for an enlargement of the Company's existing works at Ravenswood, and the first streets were opened for putting down mains in New York. The works were practically ready for making gas in September last; and it is expected that the tunnel will be complete by next July, and about 160 miles of mains laid by September. The carrying out of the scheme has been supervised by the President; and the several portions of the works have been entrusted to thoroughly competent contractors. Mr. M'Millin first entered the gas engineering profession in 1867, as Manager of the Ironton (Ohio) Gas-Works; and he continued his connection with this undertaking until 1880. About that time he became associated with the Columbus (Ohio) Gas Company, of which he became the General Manager in 1883. It was while he was directing the affairs of this Company that he came to recognize a fact that is now an accepted axiom of gas supply—viz., that the lowest price for which a gas company can sell its product and earn fair interest on the money invested in the undertaking, is the figure that ensures satisfied consumers, increases the use of gas, and in the end makes more money for the shareholders than any other policy that can be adopted. In 1889, in connection with the late George Shepard Page, he brought about the amalgamation of the lighting interests of St. Louis; reorganizing the several companies as the Laclede Gas Company, and taking the position of President. Soon afterwards, he formed a Syndicate and bought the undertaking of the Columbus Gas Company, and became its President; following a similar course with the East River Company. Mr. M'Millin is likewise President and General Manager of the Milwaukee Gas Company, whose property was acquired last year by the Western Gas Company.

Coming now to the works under notice, the first thing taken into account in constructing the new plant, was the installation of machinery capable of making gas of the best quality at the most reasonable cost, and so locating it as to allow of extensions being rapidly and inexpensively carried out without interfering with machinery previously put up. In studying the plant, it must therefore be considered as having been designed for the production of 24 million cubic feet of gas; one-fourth of it being now built, and complete in itself for manufacturing purposes. Additional property was purchased contiguous to that owned by the Company, giving considerably more than 800 feet of water frontage, including the frontage of the old works. On the completion of the new plant, the old (comprising two Granger-Collins machines of 300,000 cubic feet capacity, and a storeage holder having a nominal capacity of 200,000 cubic feet) will be done away with. In deciding upon the process to be employed, various considerations weighed in favour of water gas; and this system was determined upon. The Company's property is divided into two sections by a broad public avenue, running at nearly right angles with the wharf line; and the total area is 12 acres. On this site there is ample room for plant having a daily capacity of 50 million cubic feet. Attention was first given to the northern section; and plans were prepared for erecting on this portion works of half the above capacity—one-fourth to be constructed at once, and to be so located as not to interfere with the existing Long Island plant.

In considering the 6 million feet plant in detail, it is necessary to begin with the dock. This has a length of 475 feet; and, when complete, it will have a depth of water sufficient to give safe berth to the largest coal vessels engaged in the harbour trade. There will be a 15-feet roadway along the bulkhead, on which are laid rails for the travelling coal-elevator, for transferring the coal from the vessels to the stores or "pockets." This elevator is fitted with a self-filling single-chain clearing-bucket, operated by hydraulic power. The bucket delivers the coal to the gravity cars on a platform at a level with the tracks for distributing the coal in the stores. On this is a scale for checking the weight of the consignments received. For the delivery of power to the elevator, a hydraulic supply-pipe is run along the face of the stores, with connections at various points under each of the distributing-tracks, for taking the gravity cars from the elevator to the point of dumping over the store. The generator coal-store, located directly in the line of the generator-house, has a 92-feet frontage, with length and depth sufficient to store 6000 tons of "broken" size coal. The steam coal-store, located directly in line with the boiler-house, has a frontage of 45 ft. 6 in., and a capacity of one-third that of the generator store. Both are constructed with iron frames, and timber sides and flooring. The bottom of the store is elevated 9 feet above the ground-level, and is fitted with self-screening hoppers, delivering the coal into charging-cars run on a system of tracks leading to a hydraulic lift for delivery to the generator-house. This lift is also used for raising the ash-cars from the lower floor of the generator-house to the track, running through the generator coal-store to a bin at the river front. The bottom of the steam coal-store is elevated to an even height with the generator coal-store, and is fitted with hoppers for delivering coal to charging-cars run on tracks leading to the boiler-house. The system of tracks for the steam coal has a spur connecting with the generator coal system, to allow of the removal of screenings from the small bins under the screens, and the delivery of it to the boilers. The coal storeage is designed sufficient for a 12 million cubic feet daily capacity; no additional machinery of this nature being

required on the construction of the second quarter of the complete plant. For the third and fourth quarters, duplicate plant will be built to the south.

The safe and accessible storeage of naphtha or crude oil is a subject on which very much thought was expended in laying out the works. Underground tanks have many disadvantages; while tanks above ground are, under some circumstances, a menace. To store oil in properly protected tanks, where leakage may be discovered and quickly stopped, with proper safeguards to prevent serious damage in case of accident, was the object sought; and it has been achieved. For the 6 million feet plant, four tanks, 30 feet in diameter and 36 feet high, are built; giving a probable 30 days' storeage. The crowns or roofs are water-protected; and they are set upon foundations having sufficient rise to give proper drainage. Round the tanks is built a wall furnished with the required stay-rods, enclosing a sufficient area, and high enough to contain the contents of a tank should it split. This masonry basin is drained by a specially arranged underground pipe leading into the relief holder of the old plant, now being arranged as a tar tank of the new. It is expected to keep a layer of water of sufficient depth on top of the lighter and heavier drips—the upper surface at a level 2 feet above mean high water in the river; the overflow-pipe from the bottom of the water to the river being fitted with a back-pressure valve, to prevent the entrance of salt water in case of extreme tides. The drainage-pipe from the oil-tank catch-basin emptying into the tar-tank near the top of the water stratum, will naturally displace the water—driving it into the river. The oil will be pumped from the tar-tank for earliest use in enriching gas—water being replaced at the same time. The tar-tank is sealed from the atmosphere by the single-lift holder shell, to be repaired and properly weighted. Should the oil in the catch-basin be on fire, it will naturally be extinguished by its seclusion from air in the drain-pipe from the catch-basin. For each added quarter plant, four additional tanks will be required, each in turn being provided with a catch-basin connected to the drain-pipe to the tar-well. The pumps for clearing the tank barges and for supplying the small measuring-tanks near the generator-house, are fixed in a small brick structure formerly used as the exhauster-house of the old plant. The water in the Ravenswood district of Long Island City being bad, a special supply has been obtained from meadow lands not far from the works.

The raw material having been received and stored, we will now turn to the manufacturing appliances. The boiler plant is located in a separate house, 33 ft. 3 in. by 80 feet in the clear, with 19 ft. 6 in. under the lower chord of the roof trusses. It adjoins the generator-house, but has permanent brick walls at both ends and on one side. On the other (or south) side, the iron trusses of the roof are supported on a girder running the entire length of the building, which is in turn supported on iron columns so located as not to interfere with the cleaning or replacing of the tubes in the boilers. Between these columns a temporary "curtain" wall, fitted with windows, has been built. This building is of sufficient size to accommodate the additional boilers required for the second quarter plant. On the construction of the third and fourth quarters, a duplicate building will be put up to the south—the girder mentioned above supporting one end of the roof trusses. The curtain wall will be removed—opening the double boiler-house into one room; and, in order to get light, thus excluded, a portion of the roof will be removed, and a skylight inserted in a frame provided in the roof trusses. The roof is of slate on purlins. The boilers are in two batteries, each of two 150-horse power Heine type, fitted with grates suitable for the consumption of buckwheat coal, and therefore screenings. The gases of combustion are taken from the top at the rear, and are led by a wrought-iron breeching to the chimney-stack. The breeching and stack have sufficient area to take care of the boiler capacity required by the second quarter, a duplicate to be erected with the boilers in the duplicate house. The stack is 150 feet high of the works, 84 inches in diameter, and built of steel. It has a bell base, and is without guys of any description. The engines and Sturtevant blowers are located together with oil-feed pumps in a separate erection, built directly behind, of the same width and on the same plan as the boiler-house, with the exception that its eastern end is a temporary wall of corrugated iron, which will be removed to allow for extension eastward to accommodate two additional machines for the second quarter of the works. There is now one spare machine in three; and on the completion of the second quarter there will be one spare in five. Space is arranged for a duplicate blast-power house on the same plan as that described for the boiler-house. The three engines are each of 75-horse power, high speed, centre crank, with centrifugal governors. The three blowers are the standard Sturtevant make, No. 10 size. The delivery-pipe from each blower to the blast-main is fitted with an automatic drop-gate, to prevent the return of air to a blower not running. This main is carried underground, laid in a brick-walled trench into and about the generator-house, and is split into branches for the main, secondary, and tertiary services to the machines.

The generator-house is 100 feet clear in the span and 74 feet in length, with 17 ft. 9 in. to the charging-floor, and 30 feet to the lower chord of the roof trusses. The wall facing the river and the side walls are of brick; the rear wall facing eastward is of corrugated iron, so hung as to make it possible to take it down and store it for use on the erection of the third section of the works, should this be built singly prior to the fourth. In the generator-house there are six machines, each of a million cubic feet capacity. Everything is arranged for the extension of the building eastward, so as to allow of the addition of six more machines for the second section. The twelve machines of the third and fourth sections are to be erected on space reserved for them to the south of the extended boiler and blast-power houses. The generating plant consists of six sets of standard double-superheater Lowe apparatus, and has a total capacity of 6 million cubic feet per 24 hours. The generators, carburettors, and superheaters are each 11 feet outside diameter. The generators are supplied with proper ash-pits and dumping-doors, in order to facilitate the removal of ashes. The charging-doors are in triplicate on each generator head. They and the ash-doors, as well as other parts of the apparatus, are designed in accordance with the most recent ideas of convenience and durability. The apparatus is built to work on the reversed steam principle; so that gas can be made up through the fire or down through the fire at will. One of the peculiarities is the oil-heater, which is a part of the connection between the superheater gas-outlet and the wash-box or seal. In this the heat of the hot gas leaving the superheater is utilized in pre-heating the oil, with resulting economy in the quantity employed. The oil used in the manufacture of gas is drawn from two large measuring-tanks and forced by duplex pumps through the oil-meters, which are conveniently located on the operating-floor, and on through the oil-heaters to the carburettors—the oil being sprayed into these through a Collins injector. The oil-meters, in addition to the usual counters, are each fitted with an enlarged dial, so that the speed with which the oil is being passed to the machines may be readily observed by the gas maker from his position at the valves. The dial is so arranged that it can be set back to zero at any time, without interfering with the progressive counting.

The coal for generator purposes in the charging-cars is taken from the hydraulic lift, on which it was left in describing the coal storeage plant, on to a platform, where the weight in each car is registered and accounted against the machine to which it is sent. This platform is level with the lower chords of the roof trusses in the generator-house, upon which a system of tracks is arranged leading to the charging-hoppers, located one over each generator head, and likewise supported by the roof, which was designed to carry from the walls this added weight, as well as the usual 40 lbs. per square foot. These charging-hoppers are divided into three compartments, so arranged that each must get one-third, the contents of the car delivered into it. Each compartment is supplied with a bottom gate and a telescopic shoot; the slides being operated by a single lever, and each one arranged to cover its particular charging-door of the three mentioned above. When a charge is to be made, the covers are swung off the holes, the slides are lowered, and the grates opened; the equal divisions of the contents of the hopper being simultaneously dropped into the generator—thus giving as nearly as possible an even bed of coal in the machines. The slides are then raised—permitting the use of poker bars without interference. The floor of the house is of cast-iron plates, carried on I-beams supported by Z-bar columns; and the arrangement of the coal-feeding plant leaves absolutely no cars on the floor, which is thus left free for the most convenient handling of the machines. The off-takes from these, through the wash-boxes, with their seals, are joined in an overhead wrought-iron pipe, 36 inches in diameter. This is changed to cast iron where it is carried underground, and leads to the scrubber and condenser house, to be next described.

The scrubber and condenser house is 41 ft. by 63 ft. 9 in. in the clear, with 26 feet under the lower chord of the roof trusses. The northern end and sides are of brick; the southern end being a temporary iron frame covered by corrugated iron—permitting the extension of the building to the south, to accommodate the necessary machines of like nature for the added sections of the works. The roof is also of corrugated iron, on iron trusses, to permit the removal of a sheet, should it ever be necessary to replace a tube in the condensers. The scrubbers are of the regular form, and each large enough to deal with upwards of a million cubic feet of gas per day. The condensers are the multitubular pattern, with the tubes so arranged as to give the greatest efficiency per square foot of area. The scrubbers and condensers are in pairs—each scrubber being directly connected to a condenser—and are so equipped with valves that any one or more pairs may be thrown out of service at will. Sufficient space is reserved adjacent to the condenser-house for the accommodation of suitable refrigerating plant, when the demands of condensing make this method more economical than water. The gas travels from a manifold opening off the 36-inch pipe up through the scrubbers across to the top of the condensers, and down through the tubes of these to a manifold pipe, in which it is collected for a 30-inch pipe leading to the relief holder, with bye-pass directly to the purifier-house, and from the relief holder to a manifold pipe in the exhauster-house.

The exhauster-house is 26 ft. by 88 ft. in the clear, with 20 ft. under the lower chord of the roof trusses. This gives sufficient room for the two additional machines for the second section of the works. The house for the third and fourth sections will be located just beyond the present house. There is now one spare exhauster in three, each with an independent vertical directly-connected engine on the same bed-plate. The connections, all of which are above ground, are so made that one or all of the machines may be used to take the gas from the relief holder, and drive it on through the purifiers and meters into the storeage holders. The engines are provided with the ordinary ball governors; but there is fitted to the main steam-pipe leading to the engines a Huntoon governor. This is not called into action until the back-pressure rises to 18 inches or more, but cuts off the steam completely when the pressure reaches 21 inches—thus reducing the liability to the blowing of seals.

The purifier-house is 56 ft. 6 in. by 144 ft. in the clear, with 15 ft. 6 in. to the operating-floor, and 31 ft. 4 in. under the lower chord of the roof trusses. In the design of the purifying plant, several novelties have been introduced. There are two sets of boxes, 24 ft. by 30 ft. by 5 ft. 6 in. deep, fitted to carry a shallow layer of ashes or similar substance at the bottom, and two beds of oxide of equal depth. The cast-iron operating-floor is carried on ledges cast on the sides of the boxes 4 inches down from the top. The covers are flat, stiffened by deck beams. The boxes are carried on I-beams spanning the building from side to side, supported in turn upon cast-iron columns, 16 to each box. The connections to the boxes are 24 inches, with improved centre-seal, permitting the throwing out of all the boxes. The advantage of a valve giving this possibility is especially appreciated where oxide is used, with partial revivification during use and revivification *in situ*. For the purposes of the latter process, a connection is made from the main blast system to a system of wrought-iron piping leading to the inlet-pipe of each box. Through this air may be forced into any box by opening a valve. There is also a system of piping leading from each outlet-pipe, by which the air, after passing through the oxide, is carried through a water-seal to the boilers and out by the stack; thus eliminating one of the chief objections to the gas-making industry. These systems of piping are reversible; permitting the air to be taken through the oxide from below or above. On account of the location

of the centre-seals, it is possible to place two hydraulic lifting jib-cranes in such a position that each swings over the centres of the four boxes at its end of the building. These are of sufficient capacity to lift a cover and place it on the rests provided on the adjacent covers; thus doing away with the moveable carriages. These cranes are also arranged with a small cylinder and ram operating a rope-rigged hoisting-block for lifting the oxide from the lower or revivifying-floor. When it becomes necessary to remove the oxide for better revivification, it is dumped through bottom shutes supplied for the purpose, and spread over the cement floor below. When again ready, it is shovelled into specially-designed "buggies." These are wheeled under the cranes at some point between the boxes, hoisted by the rope rigging, and swung over the box and dumped. For this many of the cast-iron plates of the operating-floor are fitted with rings for lifting them out when required. The roof of this building has been so designed that it replaces the usual guys for the support of the top pintle of the cranes; and, in order that the strain may be carried down to the foundation, the trusses are supported on iron columns properly braced. It may be curious to note that this construction, though more expensive in iron, is really less costly in the total, owing to the saving of masonry in pilasters and thickness of the walls. It further allowed of the proper proportioning of the columns in the south side to support one end of the trusses of the purifier-house for the second section, which is to be built adjoining. The curtain walls may then be removed, as the corbel for supporting the operating-floor plates is carried on an arch which will be common to both. The purifier-house of the third and fourth sections will be built in like manner, but separated from the first and second to give better light. The roofing is of slate upon yellow pine planking, dressed and oiled for ceiling.

The meter-house is at present 67 ft. by 44 ft. 2 in. in the clear, with 18 feet under the lower chord of the roof trusses from the floor, and with a cellar 11 feet deep for connections. This is large enough for four 16 ft. by 16 ft. meters, two of which, for the 6 million cubic feet plant, have been provided. They have 24-inch connections; and owing to their location with their dials facing, in the complete plant, these are always in evidence. For the present, the space to be occupied by the meters for the second section will be divided up for office purposes, pending the erection of the office building. The plans of the office provide the usual accommodation.

As it was decided to utilize the holder of the original plant as a relief holder for the new works, it became necessary to provide storeage at once for current business. Time did not allow of the erection of a large holder; and therefore it was determined to put up a small one first, and place it in such a position that it could be eventually used as a relief holder for extensions of the new plant. A suitable site having been chosen, the largest convenient holder was at once commenced. It is of 600,000 cubic feet capacity, in a metal tank; and it is 90 feet in diameter and 30 ft. 9 in. deep, in three lifts of 30 feet each, and has an untrussed crown. The connections are 36-inch; and they are so arranged that both inlet and outlet may be used as one pipe. With the exception of the guide-rollers, there is no cast iron whatever in the structure. In arranging the storeage for the first section of the new plant, it was decided to erect a holder that would have the entire capacity; and the one now in course of construction is a four-lift, which will work in a metal tank 190 feet in diameter, and 49 ft. 6 in. deep. The dimensions of the lifts are as follows: Inner lift, 179 ft. 4 in. diameter and 48 ft. 6 in. deep; second lift, 182 feet diameter and 49 feet deep; third lift, 184 ft. 6 in. diameter and 48 ft. 6 in. deep; outer lift, 187 feet diameter and 49 ft. 2 in. deep. The holder will afford storeage for about 5 million cubic feet of gas. The difference in the depths of the lifts is due to the grip of the second lift having been raised above the level of the inner lift, and the curb of the outer lift dropped below the cups of the other lifts. The tank is believed to be the largest metal tank in the world. It is of steel; and for the shell the plates are $1\frac{3}{32}$ inches thick. Being $53\frac{1}{2}$ inches wide by 25 ft. $10\frac{5}{8}$ in. long, they are the heaviest plates rolled in America up to now. The shell metal is none of it below 32,000 elastic limit; and, by design, upwards of 90 per cent. of the gross section is made available in the joints. The thickness of each course is proportionately reduced as the courses approach the top, where it is 7-16ths of an inch. The capacity of the holder is about one-fourth greater than that of any holder in America. Like the smaller holder, this one is of steel, as is also the guide-framing; the only castings being the guide-rollers. The crown is untrussed, and is supported when landed by a yellow pine framework in the tank. The cups are fitted with Matton's patent internal overflow device, which was mentioned in the JOURNAL a few weeks ago (see *ante*, p. 431). The guide-framing extends to the top of the second lift only—leaving one lift clear when the holder is fully inflated.

With regard to the general connections of the complete 24 million cubic feet plant, the first and second sections will use the same works mains, and the third and fourth sections another system of mains, in common. These two systems are so arranged, even to the relief holders, that the half plants may be used as separate and distinct works, just as though situated miles apart, or as single works with mains twice the size of those of a single system. Any set of appliances may be completely shut off; the others still doing the work required of them. For the present, all the drips will be led to the tar-well. This is arranged with suction-pipes, so that the heavier and lighter liquors may be removed separately—the waste being pumped to the boiler-house, where it will be consumed. All drip-boxes which do not drain direct to the tar-well are connected to a manifold on the suction of a steam-pump; and it is proposed to fit each with an alarm—thus notifying the tender in the engine-room which drip is ready for pumping. The hydraulic plant for supplying water under pressure to the lifts, cranes, and other machinery, is arranged in the blast-power house. It consists of a battery of high-pressure pumps and an accumulator to throw 750 lbs., the working pressure.

It only remains now to briefly notice the tunnel under the river, with its two shafts, and the distributing system. The tunnel is being carried out under the superintendence of Mr. C. M. Jacobs, of London and New York, who has had long and valuable experience of similar work in England and Australia. The shafts are 9 feet square; the one on the New York side being 135 feet deep, and the one on the Ravenswood side 147 feet deep to the centre-line of the heading. The distance between the shafts—centre to centre—is 2541 feet; giving a slope of 6 inches in 100 feet towards the Ravenswood end, where there is a sump for collecting the drainage water, and a pump chamber. The heading is 10 feet wide and 8 ft. 6 in. high at the centre of the crown, which is struck with a radius of 7 feet, and joins the perpendicular sides with fillets of 2 feet radius. Preliminary borings showed firm rock; but, as the work progressed, soft material was encountered, involving the use of air pressure. The shield system was adopted for driving these portions, which were lined with cast-iron plates. The air pressure employed was remarkable—averaging 48 lbs., and even on one occasion reaching 58 lbs. per square inch. The tunnel will eventually contain three mains—two 36-inch side by side, and one 48-inch raised above them. One of the former mains will be laid as soon as the tunnel is ready to receive it; and it will feed the line of pipes running across Central Park to the west side of the city. All this continuation is in position; having been laid during the past year. From this primary feeder, secondary mains will be put down, running the length of the city from the battery to the Harlem River. Something like seven miles of these pipes, in addition to those of the 36-inch size, have now been laid, under the direction of Mr. Walton Forstall, supervised by the Department of Public Works. It is proposed to distribute gas through the entire system at an even pressure, governed at a single station; the secondary feeders, however, will be so connected to the system that later, if so desired, high pressure may be used in them, with various governing stations about the city. The initial pressure will be obtained from the 5 million cubic feet holder, which will give from 4·8 inches minimum to 11·7 inches maximum. This matter, however, will be regulated later on.

THE CROYDON COUNTY COUNCIL AND THE LAMBETH WATER COMPANY'S WORKS.

The London County Council's Proposals.

In the minutes presented by the Sanitary Committee at a recent meeting of the Croydon County Council, it was stated that a letter had been received from the London County Council, intimating that they were about to negotiate with the London Water Companies with regard to the purchase of their undertakings, and inquiring whether a proposal in the following terms would be acceptable to the Corporation: "In the event of the undertaking of any Metropolitan Water Company being purchased, any local authority outside the London county boundary and within the area of supply of such Company, shall have the option either (1) of purchasing on suitable terms so much of the works of distribution as is appropriate to the district of such local authority, with the right to a supply of water in bulk from the London County Council on terms to be arranged; or (2) of having water supplied direct by the London County Council." The Committee recommended the Council to concur in the purchase by the London County Council of the undertakings of the Water Companies, subject to the local authorities outside the London county boundary and within the area of supply of any company having the option of purchasing, on suitable terms, so much of the undertaking and works of any company as was within the district or appropriated to the district of such local authority. The adoption of the report was moved by Mr. King, who remarked that it would be within the knowledge of most of the members that the Council had already incurred a large expenditure in order to become possessed of that portion of the Lambeth Water-Works within the borough. Under the circumstances, the Committee recommended the Council not to consent to either of the two alternatives mentioned by the London County Council, but that they ask for powers to purchase that portion of the Lambeth Company's works within the borough, with a view to the supply of Croydon water. Alderman Goodwin seconded the motion. Mr. Oelrichs, one of the representatives of the Norwood ward, said he hoped that the Council would be a little more successful in this matter than they had been hitherto. They had been waiting patiently many years. The Norwood inhabitants did complain of the supply of water by the Lambeth Company; but the representatives from the district always had to explain that it was impossible for the Council to do anything until action was taken by the London County Council. The report was adopted.

Leicester Water Supply.—At a recent special meeting of the Leicester Corporation, a report of the Water Committee, recommending the acceptance of the tender of Messrs. John Aird and Sons, at the sum of £133,511, for the construction of the storeage reservoir at Swithland, and certain works in connection therewith, was under consideration. Alderman Wood, in moving the adoption of the report, stated that, in reply to the Committee's advertisement, they received nine tenders. The lowest was for the sum of £125,895; and the highest, for £189,555—a difference of about £63,000. The Committee had not recommended the Council to accept the lowest tender, from the fact that the tenderer had withdrawn, having found that he had made some mistakes in his tender. The Committee fell back on the second lowest; and it would be satisfactory to the Council to know that the contract was falling into the hands of one of the most competent, if not the most competent, contractors in the kingdom. When the new reservoir was completed, they would be able to supply 100,000 persons more than they had to serve at present. He went on to explain that the scheme, although costing a great deal for its construction, would in the end be a saving to the rates. It was not money sunk. They had 50 years in which to pay it off; and at the end of that time the reservoir would be an heirloom to the town. The report was adopted. In reply to a question, Alderman Wood stated that they had now in stock some eight or nine weeks' supply of water. They were much indebted to the consumers for their economy; as the consumption had gone down from between 17 and 18 gallons per head to a little more than 13 gallons.

METROPOLIS WATER SUPPLY.

The Quality of the Water during March.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month, show that the average daily supply was 185,463,942 gallons, as compared with 182,275,807 gallons in the corresponding month of 1893. The number of services being 803,215, the rate was 231 gallons to each service. Of the entire bulk of water sent out, 94,569,624 gallons were drawn from the Thames, and 90,894,318 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: Taking the average amount of organic impurity in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies was: Kent, 0·7; East London (deep well), 1·2; Colne Valley and Tottenham, 1·7; New River, 2·4; East London (river supply), 2·9; Chelsea, 4·3; West Middlesex, Southwark, and Lambeth, 4·4; and Grand Junction, 4·8. The unfiltered river waters contained the following proportions: New River Cut, 2·7; East London intake, 5·4; and Thames at Hampton, 5·1. The Thames at Hampton was, on the 13th of March turbid and yellow in colour. It was, both chemically and bacterially, considerably inferior in quality to its condition on the 12th of February, when my last sample was taken. As delivered by the five Companies drawing from this river, however, it was of considerably better chemical quality than on the previous occasion. It was in every case efficiently filtered, and exhibited the following percentage bacterial improvement: Chelsea, 99·79; West Middlesex, 99·94; Southwark, 99·49; Grand Junction, (Hampton filters) 98·65, (Kew filters) 99·79, (Kew South filter) 99·35; and Lambeth, 99·92. The New River Cut was, on the 14th of March, turbid and pale yellow. It was, both chemically and bacterially, of nearly the same fairly good quality as in February, when my last samples were taken. It was efficiently filtered before delivery; and it was improved, bacterially, to the extent of 98·92 per cent. The raw river water of the Lea, at the East London Company's intake at Angel Road, was turbid and yellow, and chemically of worse, but bacterially of much better, quality than the Thames at Hampton. It was efficiently filtered before delivery, greatly improved in chemical quality, and ameliorated bacterially, on the average, 94·29 per cent. The deep-well waters of the Kent, Colne Valley, Tottenham, and East London Companies were of excellent quality for dietetic purposes. All these waters were clear and bright without filtration; and the Colne Valley Company's water was softened before delivery, and thus rendered suitable for washing. The Kent Company's water was again distinguished for its high degree of organic and bacterial purity. Seen through a stratum 2 feet deep, the Kent, Colne Valley, Tottenham, and East London (deep-well) waters were clear and colourless; the New River, clear and very pale yellow; and the rest of the waters, clear and pale yellow. The bacterioscopic examination of the raw river waters, and of those supplied by the various Companies, collected on the 13th, 14th, 15th, and 16th of March, gave the results contained in the following table:—

Description.	No. of Microbes per Cubic Centimetre.	Temperature in Deg. C.
Raw River Waters.		
Thames at Hampton	9480	8·0
New River Cut	1300	8·9
New River unfiltered water after passing through subsidence lakes.	420	7·8
Lea at Angel Road	4920	7·6
" after storeage	580	6·8
Thames.		
Chelsea	20	7·3
Chelsea Company's water after storeage, or just before filtration	920	7·2
West Middlesex	6	7·0
Southwark, No. 4 well	48	7·4
Grand Junction, Hampton filters	128	7·6
" Kew Bridge filters	20	7·4
" Kew south filter	62	7·8
Lambeth	8	7·5
Lea.		
New River, main filter well	14	7·1
" No. 4 filter	12	7·2
East London, No. 1 Essex well	332	6·6
" No. 2 "	344	6·7
" Middlesex well	166	6·6
Deep Well.		
Kent	14	10·5

In explanation of the abnormally high numbers of microbes found in the East London Company's filtered water, the Engineer writes me that three of the filter-beds connected with No. 1 Essex well, and three of those connected with No. 2 Essex well, were cleaned only a few days previous to the taking of the samples. No beds connected with the Middlesex well were cleaned within a fortnight of the time when the bacterioscopic examination was made. A number of these beds had been re-sanded, and had not become properly consolidated.

In the course of their report for the past month to the Official Water Examiner (Major-General A. de Courcy Scott, R.E.), Messrs. Crookes and Odling say: Of the 175 samples examined, two were recorded as "slightly turbid," and three as "clear, but dull." The remainder were clear, bright, and well filtered. Four out of these five samples were from the East London mains at Cambridge Road; and their deviation from the usual brightness was due to the disturbance caused by the laying of 4200 yards of new 24-inch main, and its connection with Cambridge Road and neighbourhood. The slight turbidity consisted chiefly of oxide of iron—a perfectly harmless body. The rainfall during the month of March was of a somewhat peculiar character. The mean quantity for this month over a period of 25 years is 1·59 inches; and the actual amount of rain recorded at Oxford has been 1·67 inches—showing an excess of 0·08 inch. But nearly the whole of this rain fell during the first half of the month; no less than 1·29 inches falling in three days—the 1st, the 12th, and the 14th. During the second half of the month, from the 15th to the 29th inclusive, not a drop of rain fell; and on the last two days, only 0·04 inch was recorded. As far, therefore, as regards the filling of the springs and underground storeage strata, the past month may be considered a dry one, inasmuch as the bulk of the very heavy rain of the three wet days would have little opportunity of soaking into the ground, but would be hurried away along the water-courses to the sea. Taking the three months forming the first quarter of 1894, and comparing them with the corresponding quarter of 1893, we find that, whereas in 1893 there was a deficiency of 1·07 inches, in 1894 there has been a deficiency of 0·76 inch. In chemical composition, the Thames-derived waters are rapidly approaching their high summer standard. The following table shows that, in every instance, the good quality we remarked in our report for February was slightly exceeded in March:—

	Common Salt per Gallon.	Nitric Acid per Gallon.	Hardness, in Degrees.	Oxygen required per Gall.	Organic Carbon per Gall.	Organic Carbon per Gall.
February	2·355	1·160	15·58	0·058	0·140	0·202
March	2·285	1·101	15·32	0·052	0·121	0·162

Note.—All the figures are means except those in the last column, which are maxims.

Colour.—February, 23·3 brown to 20 blue; March, 21·3 brown to 20 blue.

TORQUAY WATER SUPPLY.

Mr. C. Hawksley to Investigate the Water Question.

The subject of the quality of the water supplied to Torquay has, as our readers are aware, given rise to much discussion in the town; the contending parties being represented respectively by the Water Committee of the Corporation and the Burgesses' Committee. With a view of setting at rest the points at issue, it has been decided that Mr. C. Hawksley shall go exhaustively into the question of the present sources of supply, hold an inquiry so as to receive evidence and opinions, and personally investigate all the allegations which may be made. Both the Water Committee and the Burgesses' Committee have had samples of the water analyzed. The latter Committee submitted their samples to Dr. A. Wynter Blyth, the Medical Officer of Marylebone, who is the Devonshire County Analyst, and Dr. T. Stevenson, one of the Government Analysts, and Lecturer on Chemistry at Guy's Hospital. Both of these gentlemen report that the water is free from sewage contamination; but they each recommend sand filtration. The water is described as tinged with peat, and as being free from the acidity which is possessed by some waters derived from upland surface sources, which, when present, acts upon the lead of service-pipes. Such organic matter as Dr. Stevenson detected, he describes as peaty, and probably harmless. He says that, when filtered, the water will form an unexceptionable town supply. At a recent meeting of the Town Council, the Clerk (Mr. F. S. Hex) read some letters which had passed between the Water Committee and the Burgesses' Committee on the subject of the instructions given to Mr. Hawksley. The Honorary Secretary of the latter Committee (Mr. W. S. Thomas) wrote that they were willing to join in the appointment on certain conditions, which he specified. These were, briefly, that both Committees were to put their views in writing, exchange them, and then lay them before Mr. Hawksley 14 days before he enters upon his duties as referee; any further assistance to be afforded by selected members of the Committees, not exceeding three from each. Alderman Richardson moved that the letter containing these propositions should be referred to the Water Committee; remarking, in so doing, that he thought they had nearly come to what would end in an agreement between the disputing parties. Mr. Rookhey seconded the motion. The Mayor (Alderman J. P. C. Shrubb) said they had now a grand opportunity of settling their differences. He thought most distinctly that the Burgesses' Committee had made a concession to the Corporation, and that the Council should make one to the Committee. He saw no reason why they should not shake hands over the job. The motion was carried. The Water Committee have since expressed their willingness to agree to the various conditions proposed by the Burgesses' Committee; and it is anticipated that Mr. Hawksley will hold his inquiry on the 2nd prox. There is consequently every prospect of the difficulty being settled at an early date.

Cressbrook and Monsal Dale Water Supply.—On Saturday, the 14th inst., a scheme of water supply for the above-named places, which are near Buxton, was completed. A reservoir capable of holding 33,000 gallons has been constructed. The cost has been about £1500, inclusive of a couple of miles of pipes; and it has been borne by a local benefactress.

The New Water-Works for Larne.—The Larne Town Commissioners have had a letter from the Local Government Board for Ireland, stating that they have received the report of their Chief Engineering Inspector (Mr. C. P. Cotton) upon the inquiry which he recently held relative to the proposals of the Commissioners as to providing a further supply of water for the town (see *ante*, p. 451), and that they have given instructions for a draft Provisional Order to be prepared in accordance with their prayer.

Preston Water Supply.—The Preston Corporation having applied to the Local Government Board for sanction to borrow £95,500 for water-works purposes, Mr. T. Codrington, M.Inst.C.E., one of the Board's Inspectors, held an inquiry at the Town Hall in that borough last Wednesday. The Town Clerk (Mr. H. Hamer) enumerated the various Acts by virtue of which the Corporation secured the water-works, and under which money had been borrowed. He said the amount so raised was £320,225, of which £284,941 was still owing. They now required £95,500 for a new storeage reservoir at Alston, with a holding capacity of 275 million gallons. This reservoir was absolutely necessary after the experience of last summer, when the Corporation had to call upon the adjoining landowners to assist them. There was no opposition to the application.

THE ELECTRIC LIGHT IN MANCHESTER.

The Manchester Corporation have not shown any undue haste in the formal opening of their electric lighting station. It is about nine months since the light was first brought into use in the city; but the "opening," for some reason or other, only took place on the 13th inst. The ceremony assumed the form of the unveiling, at the station in Dickinson Street, of a tablet on which are inscribed the date on which the supply of the current was begun, and the names of all who were associated with the installation at its inception. Mr. Alderman Gibson, Deputy-Chairman of the Gas Committee (in the absence of Mr. Brooks, the Chairman, through ill-health), and Sir J. J. Harwood and Mr. Alderman Lloyd Higginbottom, Chairman and Deputy-Chairman of the Electric Lighting Sub-Committee, were the chief speakers. There were also present a number of members of the Gas Committee and Mr. C. H. Wordingham, who was at the last meeting of the City Council appointed to succeed Mr. Herbert Wooler as Resident Electrical Engineer to the Corporation.

We have from time to time given particulars in regard to this installation; but it may be of interest to briefly recapitulate them. The system of distribution and the generating plant have been constructed from plans prepared by Dr. John Hopkinson, Consulting Engineer to the Corporation. In general, it may be described as the continuous current, five-wire, direct-feeder system. The station, the site of which extends to 5765 square yards, is centrally situated in respect of the area of supply; and its proximity to the Manchester and Rochdale Canal gives it special facilities for coaling purposes, and for the supply of condensing water. The boiler-house is 77 feet long and 70 feet wide; and it is covered from end to end by a large water-tank, constructed entirely of wrought steel, weighing about 160 tons. It is built in seven compartments, and will hold 205,000 gallons. The boilers are six in number, of the Lancashire type, each 30 feet long and 8 feet in diameter; and they are provided with Vicar's mechanical stokers, and with all necessary fittings in duplicate. They work at a pressure of 125 lbs. to the square inch. The engine and dynamo house is 200 feet long, 80 feet wide, and 43 feet high. It is lined with glazed bricks throughout, and divided into two bays—a 10-ton crane travelling the whole length of each bay at an elevation on longitudinal girders, to facilitate the handling of the machinery. The foundations for the machinery are of solid concrete, 12 feet thick, in order to prevent the possibility of vibration and consequent annoyance to neighbours. The ten engines are of the compound vertical condensing type, working at a pressure of 120 lbs. Four of them develop 400-horse power each; and six, 100-horse power each. The dynamos, ten in number, are driven by linked leather belting with jockey pulleys. There are four large machines, each with an output of 590 ampères at 410 volts; and six small ones, each giving an output of 590 ampères at 102 volts. The switchboard is of special design, with horizontal and vertical bars, and is so arranged that any pair of feeders may be coupled to any large dynamo, or the several feeders grouped in any arrangement on one or more of the dynamos. The mains consist of bare copper strips, supported on porcelain insulators set in concrete conduits and insulated rubber cables in cast-iron pipes. A special feature of the mains is that the electricity, whether for lighting or motive power, can be supplied to consumers at four different pressures, according to requirements.

When the supply was first begun, there was a good deal of grumbling on the part of the consumers about the unsteadiness of the light; but this difficulty has now been almost entirely overcome by the provision of continuous-current transformers at Piccadilly and the Royal Exchange. In spite of the complaints, the demand for the light has been much greater than was anticipated. The present plant is estimated to supply 20,000 incandescent lamps of 16-candle power. It was thought that this would suffice for about three years; but already the current is being supplied to 18,594 lamps of 16-candle power, 250 arc lamps, and motors to the extent of 16-horse power. It is probable, therefore, that an early extension of the plant will be necessary. The Corporation have power to borrow £150,000 for electric lighting purposes. A sum of £70,000 has been already spent; and it is thought probable that all the remainder will be needed to carry out the necessary extensions of generating plant and mains.

Chesterfield District Water Supply.—On Wednesday last, Major-General Phipps-Carey held an inquiry at Chesterfield, on behalf of the Local Government Board, in regard to an application from the Chesterfield Rural Sanitary Authority for permission to borrow £15,000, to enable them to supply water in certain neighbouring parishes. The Clerk to the Guardians (Mr. G. Shaw) explained that the necessity arose in 1877 to provide water to what was known as the northern scheme—consisting of Coal Aston, Dronfield, Whittington, Eckington, Holmesfield, Killamarsh, and Unstone—for which, up to 1884, the Authority borrowed, in round figures, £40,000. The scheme was designed to supply, according to the 1871 census, 15,760 persons with water. But the population had increased to 23,143 in 1881; and between 1881 and 1891, the Authority had found it desirable to purchase the Staveley Water Company's undertaking for £29,000, so as to increase the supply. The parishes of Staveley and Barlow were added to the northern scheme; and this made a total outlay of about £69,000. In 1888, the Local Government Board granted a Provisional Order amalgamating the two concerns on the application of the Authority; and they were now known as the united scheme. The £40,000 loan had been reduced to £23,470; and the £29,000 loan, to £23,527. The Authority now applied for a further loan, which he thought they could get at 3½ per cent. for 30 years. The Engineer (Mr. Frith), having explained the present system of water supply, said the proposed reservoir would be on the Barbrook Stream. They had not thought it necessary to go to much expense in sinking trial pits. They would go down to a good foundation; and suitable ground had been found. The Inspector remarked that the scheme appeared to be a most hap-hazard one. Objections to the application were heard from representatives of Unstone and Coal Aston, and the inquiry closed.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Dundee Gas Commission are the first this year to tackle the subject of coal contracts for next year; and their experience gives some notion of what others may expect. The prices are considerably up. Cannel has not varied much from the present year's rates; but splint is said to have risen about 1s. 6d. per ton. Taken all over, there is an increase of about 4d. per ton. The Commissioners in Dundee have a considerable quantity of this year's contracts still undelivered, which will help them; but it is expected that a slight increase in the price of gas will be necessary.

The Bill which the Edinburgh and Leith Gas Commissioners are promoting in the House of Lords, to extend their borrowing powers and to reconstruct the Leith works, is likely to pass as an unopposed measure. The Commissioners have purchased a large area of land on the other side of Assembly Street from their works; and they propose to close up the street, and incorporate it in the works. It so happens, however, that the Leith Dock Commission have a right to call upon the North British Railway Company to make a level crossing over their line at the foot of Assembly Street. Both the Dock Commission and the Railway Company threatened opposition to the Bill; and Mr. Kinloch Anderson, the Convener of the Works Committee of the Gas Commission, Mr. F. T. C. Linton, the Engineer at Leith, and Mr. J. M'G. Jack, S.S.C., the Clerk, were sent to London this week to try to come to terms with the opposing parties. This they were able to do, by offering to construct a street across their new site in lieu of Assembly Street, and to have the right of the Dock Commission to a level crossing transferred to it. The Bill is expected to be before the House of Lords Committee on May 1.

It is reported that Mr. Thomas Lightbody, of the Tradeston station of the Glasgow Gas Trust, has been appointed Manager of the Renfrew Corporation Gas-Works.

The Greenock Gas Trust have resolved to introduce the Peebles oil-gas process. They met on Tuesday to consider a report by a Sub-Committee on the subject—a very detailed and carefully drawn up description of the plant and its working, which must have helped the Trustees greatly in making up their mind. The installation they propose to establish is to consist of twelve retorts; and it is estimated to cost between £1200 and £1500.

The Barrhead Gas Company, of which Mr. J. W. Carmichael is Manager, have also resolved to adopt the Peebles process; and they have let the contracts for the execution of the work.

The Forfar Gas Corporation on Monday had before them a report by Mr. D. B. Esplin, their Manager, upon the subject of oil-gas manufacture. In order to be able to prepare his report, Mr. Esplin went to Perth to see the Peebles process at work. In his opinion, the wear and tear of the retorts is an important item financially, as they are liable to crack in a short time after use. Mr. John Dennis, of Dalkeith, who is contractor for the Oil-Gas Enrichment Company, the owners of the Peebles process, had visited Forfar; and his estimate of the cost of an oil-gas plant was £600. The Commissioners resolved to wait for further information, before deciding as to the adoption of the oil process. When Mr. Dennis was at Forfar, Mr. Esplin also asked him to report upon the cost of adapting the retort-bench to Mr. Dennis's system of semi-regenerative firing. Mr. Dennis's estimate for the reconstruction and adaptation of four ovens was £220. Consideration of this subject was also delayed.

In Brechin the Town Council are not particularly favourably disposed towards the Gas Company, which is, it must be confessed, a by no means infrequent experience. On Thursday night, when the gas Company applied for permission to open up a street for the laying of a duplicate main, Provost Vallentine said it appeared from an old minute that in 1873 the Gas Company undertook to supply gas for the public lamps at cost price, which was then 4s. 2d. per 1000 cubic feet. A statement drawn up from the Police Treasurer's books showed that, instead of the gas being charged at that figure, the Company had considerably raised the price, and charged the ordinary domestic rate; so that, since 1873, the overcharge, with simple interest, amounted to £575 13s. 6d. Whereupon a motion was made for the refusal of the application; but it transpired that some years ago the opinion of Counsel was obtained on the subject, which was that, while the Gas Company could claim the right to open streets for the purpose of repairing or renewing pipes, they could claim no privilege in the matter of opening streets which had never been opened before for the laying of new mains. This rather turned the tide; and the permission was, after some talk, granted without prejudice to the interests of the Town Council.

The action which I mentioned some time ago as having been raised in the Elgin Sheriff Court by a farmer named Hood against Mr. W. Taylor, the Manager of the Elgin Corporation Gas-Works, in which £200 was sued for as damages for alleged assault, has, happily, been decided in favour of Mr. Taylor. Sheriff Ivory holds that the pursuer has failed to prove that he was assaulted; and he founds his opinion on the fact that the pursuer admitted that before he called upon Mr. Taylor he had three glasses of whisky, which not only rendered him incapable of giving reliable testimony, but contributed materially to his falling and injuring himself. Gas managers will be glad that Mr. Taylor is thus cleared of an ugly charge.

Many of your readers will be pleased to learn that the Works Committee of the Edinburgh Water Trust have unanimously agreed to recommend the appointment of Mr. J. Wilson, C.E., to the post of Engineer to the Trust. As stated recently, Mr. Wilson only a few months ago went from Greenock to Edinburgh to join the firm of J. and A. Leslie and Reid, who were the Engineers; and since his admission to that firm, both the other partners of it have died. The appointment is to be on the same condition as it was held by Messrs. Leslie and Reid—a standing salary of £400, with commission upon new work, and liberty to engage in outside business. Some of the Trustees are favourable to the appointment of an engineer who would be exclusively the servant of the Trust. The majority, however, are prepared to adhere to the old method; and as the unanimous recommendation

of the Works Committee will be difficult to set aside, Mr. Wilson may be looked upon as already appointed.

Mr. J. M. Gale, C.E., the Engineer to the Glasgow Water Trust, has passed through a severe illness, which he caught in the discharge of his duty; and at a meeting of the Trust on Thursday, he was granted three months' leave of absence.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 21.

Sulphate of Ammonia.—The market is in an apparently helpless condition in so far as it is completely in buyers' hands. Consumers' orders remain unaccountably absent; and it is conjectured, seeing that shipments are proceeding on a fair scale, that a large speculative business has been done, and that, although the market is superficially so weak and depressed, the business is by no means correspondingly dead. These sales were, of course, made at much lower prices than the current quotations; and great efforts are being made to steer the market in the direction of a profit. It seems, therefore, clear that producers must either withdraw from the market for a time, in the hope of better things by-and-bye, or else submit to the lower values. The fall since March is now about 15s. per ton; but it must not be forgotten that, even compared with last year, the present range is still a decidedly high one. The price at the end of April in 1893 was £12 5s.; and only £10 5s. at the same period in 1892. Nitrate remains steady at the advanced quotation.

LONDON, *April* 21.

Tar Products.—The condition of benzols, especially 90's, is no better; indeed, 90's are spoken of as 1d. a gallon less than last week's price. There is more inquiry for 50's; and the probability is that the value of this may improve before long. Carbolic acid is in good demand; and inquiries for forward contracts are more numerous. Solvent naphtha is distinctly stronger, and business at 1s. 3d. has been reported. Anthracene remains in the same position; and pitch is to-day steady at last week's quotation. Neither buyers nor sellers seem very anxious to do business. Prices may be taken as follows: Tar, 12s. 6d. to 17s. Pitch, 26s. to 27s. 6d. Benzols, 90's, 1s. 1d.; 50's, 1s. 4d. Creosote, 1¼d. Creosote salts, 25s. Solvent naphtha, 1s. 2½d. to 1s. 3d. Toluol, 1s. 8d. to 1s. 9d. Cresol, 1s. Crude benzol naphtha, 30 per cent., 6d. Carbolic acid, 60's, 1s. 8d. Anthracene, "A," 1s. 2d.; "B," 11d.

Sulphate of Ammonia has shown considerable weakness; and as low as £13 2s. 6d. has been reported for business in Scotland, but £13 5s. to £13 7s. 6d., less 3½ per cent., is more like the Hull and London prices. Nitrate of soda continues its advance, and is several shillings per ton dearer than last week. Gas liquor is now quoted at 9s. to 11s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The outlook in the coal trade of this district certainly does not improve; and ominous rumours are afloat that before very long the coalowners, owing to the steadily increasing depression and the continued downward tendency in prices, will feel themselves compelled to again bring forward some substantial reduction in wages. This, of course, creates an uneasy feeling with regard to the future, and presents the possibility of the Conciliation Board breaking up with the close of the year, as the miners are thoroughly determined that, in the event of any reduction in wages being proposed, they will insist upon the question of a minimum rate being at the same time definitely fixed. In the meantime stocks are rapidly accumulating, with the result that the Miners' Federation of Great Britain has considered it necessary to call a Special Conference in London, to consider what can be done to prevent coal being put down into stock. At a meeting of the Lancashire and Cheshire Miners' Federation held in Wigan on Friday, to consider the question of restricting the output, it was decided that the Conference was of opinion that the best means to adopt to restrict the output and prevent such large accumulations of coal in stock, was to work four days per week and eight hours per day from bank to bank; and that no man be allowed to earn more than 6s. per day. Their delegates were instructed to move this resolution at the Conference of the Federation of Great Britain next Thursday. All descriptions of round coal are a drug on the market; and although the leading Manchester colliery concerns and the Lancashire Coal Sales Association have made no further change in their official list rates, prices in the open market are weak and irregular. Best Wigan Arley coals are only in exceptional cases now fetching more than 11s. to 11s. 6d.; Pemberton four-feet and seconds Arley, 10s. to 10s. 6d.; with the lower descriptions of round coal ranging from 7s. 6d. to 8s. 6d. and 9s. per ton. With regard to gas coals, I understand that a determined effort is being made by the coalowners in Lancashire and Yorkshire to hold out, if possible, for an advance of 1s. per ton upon the prices they were taking last year, which would practically bring them back to the level of those ruling in 1892. At present, however, there are really no inquiries upon the market to actually test the prices at which contracts could be placed. Although the output of slack in Lancashire continues exceedingly small, supplies of engine fuel are coming in very plentifully from Yorkshire, where the shipping season has commenced; and there is decidedly less push in the market, with prices not quite so strong as they were. Good qualities of burgy scarcely average more than 7s. to 7s. 6d. per ton; better qualities of slack, 6s. to 6s. 6d.; with common sorts averaging about 5s. to 5s. 6d. per ton at the pit.

Northern Coal Trade.—There has been a better tone in the coal trade during the last few days; and the settlement of the large contracts for gas coals for The Gaslight and Coke and the South Metropolitan Companies has unquestionably tended to steady the trade. Best Northumberland steam coals are quoted at 10s. per ton; second-class steam, at about 1s. lower; and steam smalls are rather more abundant at from 4s. 6d. to 4s. 9d. per ton f.o.b. Gas coals are generally steady; the price for odd cargoes being unchanged at from 7s. 3d. to 7s. 9d. per ton f.o.b. The large contracts for the two London Gas Companies above named have been practically arranged for. Part of them are sold delivered in the Thames at 10s. 3d. to 10s. 7½d.; and the freight being over a period of years about 3s. 5d. per ton, it will be seen that the average price is slightly less than the combination rates, though considerably above that paid for coals contracted for to the end of the half year. In other instances, the coals are sold f.o.b. in the Tyne or Wear; and the basis of price may be put at about 7s. per ton, as near as can be calculated. There is no alteration in manufacturing coals. Coke is rather steadier. There is a better demand from the furnaces in the Cleveland, Durham, and West Cumberland districts, more furnaces being now in blast. There is only a limited demand for coke for export; the price being steadied by the large local inquiry at from 13s. 6d. to 14s. 6d. per ton f.o.b. Gas coke is quiet. The output is now limited; and the stocks are not large. The price is unaltered; but there seems to be an increasing use of broken gas coke for household purposes.

Scotch Coal Trade.—The outlook is not cheering. There is little demand for any sort, except ell, which is moving off freely. The others are being stocked in pretty large quantities. This leads to prices being, if anything, easier, and points to further reductions. As yet there is little trouble with the miners, who appear to realize that any action they may take is hopeless in face of a falling market. In the Airdrie district, 6d. per day has been taken off the men's wages; and they are idle in consequence. A conference of miners' delegates at Glasgow on Saturday resolved to agree to a national week's holiday, with the object of reducing stocks. In Fifeshire, prices have already fallen from 1s. 3d. to 1s. 9d. this year; and another reduction of 3d. per ton has been resolved upon. It is felt by coalowners that, if prices go further down, there must be a decrease in wages. The situation is thus critical; but neither side seems willing to move—both being apparently anxious not to anticipate, but rather to wait for, and profit by, the deliberations of the Conciliation Board in England. The prices quoted are: Main, 7s.; ell, 8s. to 8s. 6d.; splint, 7s. 9d. to 8s.; and steam, 9s. to 9s. 6d. per ton f.o.b. Glasgow. The shipments for the week amounted to 133,160 tons—a decrease as compared with the preceding six days of 13,236 tons; and as compared with the corresponding week of last year, of 1454 tons. Fo rthe year to date, the total shipments have been 1,962,277 tons—an increase over the same period of last year of 322,600 tons.

Oriental Gas Company, Limited.—The Directors of this Company have resolved to pay an interim dividend at the rate of 3½ per cent. per annum on account of the year ending June 30 next.

Vulcan Gas-Engine Company, Limited.—A Company has been formed under this title, with a capital of £1000, in £1 shares, to enter into an agreement with H. M. Dimsdale for the acquisition of certain patents, and to carry on business as engineers and ironfounders.

Sales of Shares.—At the Mart, Tokenhouse Yard, last Tuesday, Mr. A. Richards sold, by order of executors, "B" stock of the *South Metropolitan Gas Company* at £255 per £100 of stock; "A" stock of the *Tottenham and Edmonton Gas Company*, at £222 10s. do., and "B" stock at £162 10s. do.; original £5 shares in the *Romford Gas Company*, at £9 10s. to £10 each, and £5 "B" shares, at £7 5s. and £7 12s. 6d. each; original £10 "A" shares in the *Harrow Gas Company*, at £15 each, and £10 "B" shares at £13 5s.; original £10 shares in the *Brentwood Gas Company*, at £19 and £19 2s. 6d. each; and £5 shares in the *Woking Gas Company*, at £4 each.——At Durham last Wednesday, 17 original shares in the *Durham Gas Company* were sold at £20 10s. each, and eleven shares of different issues changed hands at £14 7s. apiece. Also 20 original shares in the *Consett Water Company* were disposed of at £8 10s. per share.——Last Thursday, Messrs. W. G. Stansfield and Co. sold by auction at Bradford, ten £10 "A" shares in the *Clayton, Allerton, and Thornton Gas Company* at £14 2s. 6d. each, and twelve £10 original shares at £16 apiece. Twenty original shares in the *Kildwick Gas Company* were also disposed of at £12 15s. each.——Last week, 28 £10 shares in the *Westerham Gas and Coke Company* were publicly sold at £10 each, and 13 shares at £10 10s. each.

Proposed Extension of the Bolton Water-Works.—At the Bolton Town Hall last Tuesday, a Local Government Board inquiry was held with regard to an application made by the Corporation for an amendment of their Local Acts, so as to enable them to borrow £35,000 for water-works purposes, and to acquire land at the several gathering-grounds. The Inspectors were Mr. T. Codrington, M.Inst.C.E., and Mr. E. P. Burd; and those present included Alderman Cannon, J.P., Chairman of the Water Committee, and Mr. R. H. Swindlehurst, M.Inst.C.E., the Water Engineer. The Town Clerk (Mr. R. G. Hinnell), in stating the case for the Corporation, pointed out that the £80,000 obtained by the Provisional Order of 1888 had been entirely expended; and that £35,000 was required for additional works. One item was in connection with the Dingle reservoir, and amounted to £3500. This was the best water the Corporation had; and it was proposed to increase the storeage capacity of the reservoir. It was also intended to improve the Heaton and Entwistle gathering-grounds at a cost of £1200 and £5500 respectively. A sum of £3000 was required for a lattice bridge at the Sweetloves reservoir; and £15,000 for new mains. The last item was £10,000 for water-meters. These appliances were expensive; so that in almost every case the consumer hired the meter from the Corporation. Under this head, £7000 had already been expended—this sum having been charged to capital account; and certain work authorized under the Order of 1888 had not been completed in consequence. The Inspectors suggested that the particulars should be amended, seeing that the £7000 had been spent; that was £3000 for meters and £4000 for works unfinished under the last Order. The Town Clerk (continuing) said the Corporation also sought for an amendment of their Act of 1888, so as to enable them to purchase a larger area of land for water-works purposes. The reason for the application was the present want of control by the Corporation over the area of their watershed. Alderman Cannon gave evidence in support of the Town Clerk's statement, as also did Mr. Swindlehurst. Plans and estimates were laid before the Inspectors, who subsequently went over the ground.

The Electric Lighting Scheme for Derry.—The Local Government Board have agreed to grant to the Derry Corporation a further loan of £2871 in excess of the former loan for electric lighting, so as to enable them to complete the original scheme for the erection of 160 arc lamps.

Additions at the Walsall Gas-Works.—On the recommendation of the Gas Committee, the Walsall Corporation have accepted a tender of Messrs. Bryan Donkin and Co. for supplying and erecting two steam-engines, two exhausters, and other machinery at the Pleck Gas-Works, for the sum of £650. The whole of the manufacture of gas will in the future be carried on at the Pleck works; and the Wolverhampton Street works are to be utilized as an electrical generating station.

Opposition to the Electric Lighting Scheme at Folkestone.—At a public meeting at Folkestone on Saturday, a resolution was passed against the action of the Town Council with regard to electric lighting. It will be remembered that the Town Council, by excluding the votes of members having shares in the local Gas Company, decided to proceed with a scheme for lighting the district with electricity, at a cost of £35,000; but (says a local correspondent) the opposition has become so strong that it is probable the scheme will be shelved.

The Fatal Gas Explosion in Manchester.—Last Wednesday week, Mr. S. Smelt, Deputy City Coroner of Manchester, held an inquest on the body of a little girl named Butterworth, whose death at Harpurhey, Manchester, through an explosion of gas, was reported in the JOURNAL for the 10th inst. (p. 663). In the course of the inquiry, it was elicited from Mrs. Butterworth that she did not know it was necessary to occasionally renew the supply of water in the chandelier. The jury found that the child had died from shock produced by an explosion of gas accidentally caused. The sympathy of the Court with Mrs. Butterworth was expressed by the Coroner, who said the explosion ought to be a lesson to everyone to be careful whenever there was an escape of gas, and not only so, but to look after all gas-fittings regularly. It was stated by the representative of the Corporation Gas Department that very few explosions occurred in the course of a year; and it was seldom that they were attended by fatal results.

The London County Council and the Water Companies' Undertakings.—Reference was made, in our article on "Water and Sanitary Affairs" last week, to the motions of which Mr. Benn had given notice, instructing the Committee on the East London, Southwark and Vauxhall, and West Middlesex Water Bills to consider paragraph 5 of the report of the Select Committee on London Water Supply (1880), with a view to inserting in the Bills provisions to enable the London County Council to acquire the undertakings of the promoting companies, "if the same can be obtained on reasonable terms." We learn that the London Conservative members, led by Mr. Boulnois, had arranged to offer strenuous opposition to the motions in question, on the ground that the water supply of the Metropolis ought to be dealt with as a whole, and that the Council should not have power to acquire the undertakings of particular Companies while others were left untouched. The result was that the motions were withdrawn.

Water-Works for Cawnpore.—The new works for providing a supply of water forCawnpore from the river at Byram Ghât, above the city, have lately been opened. The water is run into a dock, and pumped thence through a main 20 inches in diameter to the filtering-station, 3 miles away, at Bena Jhaber, by vertical triple expansion engines indicating about 80-horse power. Entering the settling-tanks, it falls over a series of steps forming a small waterfall, which tends to aërate the water. The grosser impurities having been separated by gravitation in the settling-tanks, the water is passed through the filters, consisting of 3 feet of sand of varying dimensions, and stored in a large covered reservoir ready for pumping into the city, for which purpose engines of 80-horse power are provided. The works are designed for a 3 million gallon supply; and the settling-tanks have an aggregate capacity of 9 million gallons. There are 36 miles of piping laid in the streets, with the necessary valves. The works have been constructed from plans prepared by Mr. H. G. Boyce.

Monte Video Water-Works Company, Limited.—We learn, from the report which the Directors of this Company presented at the ordinary general meeting of shareholders last Thursday, that the gross revenue in the year ending Dec. 31 last amounted to £77,519; being an increase of £1191 as compared with the previous year. The net income amounted to £48,068, as against £47,218 in 1892. After providing for interest and other charges, and adding £1011 to the fund for the renewal of buildings and plant (raising it to £15,000), there remained an available balance of £23,501 at the credit of the profit and loss account. Out of this an interim dividend of 2½ per cent. was paid on the 1st of November last; and the Directors recommended a further dividend of 2½ per cent. (making 5 per cent. for the year, free of income-tax); carrying forward the balance of £3501. It has hitherto been the custom of the Directors to charge the profits of each year with a certain sum towards providing a renewals fund. The amount so set aside has been £1500 per annum, *plus* interest at 5 per cent. on the total previously at the credit of the fund. As the Directors are of opinion that £15,000 is ample provision for any exceptional renewals or repairs, and as the sum at the credit of the fund in last year's accounts amounted to £13,988, they have only charged the past year's profits with £1011—the amount required to bring the fund up to £15,000. It is not proposed to make further additions to the fund, unless it has to be drawn upon for some special purpose. The Directors state that the Company's relations with the authorities continue satisfactory; and the working is still carried on under the provisional arrangement made in 1891, under which the Company retains all the rights and privileges granted by the original concession, with the exception that the subvention is reduced to $500 per month. There was no capital outlay of any importance during the year, with the exception of the first payment in respect of a new Worthington engine, which the Directors have deemed it necessary to erect at Santa Lucia, at an estimated cost of £3500. The Directors concluded by stating that the depression which has existed during the last few years appears to be passing away; and that there are signs of a general revival of business in the country. The report was adopted; and the dividend recommended was declared.

Exhibitions of Gas Appliances.—The Davis Gas-Stove Company, Limited, have lately held exhibitions of their appliances at Bristol, Budleigh Salterton, Cirencester, Exmouth, and Holbech; cookery lectures being given by Miss Hunt, Mrs. Marshall, Mrs. Hunter, and Mrs. Springthorpe.

Electric Lighting at Lancaster.—On Saturday, the 14th inst., the electric lighting installation of the Lancaster Corporation was brought into operation for the first time. It has been carried out at a cost of about £26,000. The price of the electric light is 8d. per Board of Trade unit; while that of gas is 2s. 6d. per 1000 cubic feet.

Suggested Transfer of the Holyhead Water-Works to the Local Board.—In consequence of the insufficient supply of water at Holyhead, the Local Board are considering the desirability of purchasing the property of the Water Company. Dr. Rees, of the Local Government Board, has recommended the acquisition of the concern; and it has been decided to await a reply from the Local Government Board as to the need of obtaining an Act of Parliament, in order to effect the transfer—the majority of the shareholders being opposed to parting with the works. The Company have resolved to expend several thousand pounds so as to avoid any scarcity of water in the future.

Bombay Gas Company, Limited.—The report of the Directors of this Company for the year ending Dec. 31 last has been issued; and it will be presented to the shareholders at their meeting on the 3rd prox. Compared with the year 1892, there was a decrease of £292 in the gas and meter rental. This, the Directors state, was partly due to the extensive use of the Welsbach burner. The number of consumers continues steadily to advance; and there is an improvement in the returns from residuals and fittings. The contract for the public lighting has been again renewed with the Municipality for one year from July 1 next. The loss by exchange for the past twelve months amounted to £20,107, the whole of which has been written off revenue. The profits, with the addition of £110 brought forward (after deducting the interim dividend paid in December last, come to £9804, out of which the Directors recommend a dividend of 3½ per cent., free of income-tax; making 6½ per cent. for the year, and leaving £1404 to be carried forward.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 744.)

Issue.	Share	When ex-Dividend	Dividend or Div. Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	**GAS COMPANIES.**				£ s. d.
590,000	10	12 Apl.	10½	Alliance & Dublin 10 p. c.	10	17½–18¾*	..	5 13 6
100,000	10	,,	7½	Do. 7 p. c.	10	12–13*	..	5 15 4
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	106–108	..	4 12 6
100,000	20	14 Dec.	8	Bahia, Limited	20	10–11	..	14 10 10
200,000	5	15 Nov.	6½	Bombay, Limited	5	5–5½	+¼	5 18 2
40,000	5	,,	6½	Do. New	4	3¾–4¼	+¼	6 2 6
380,000	Stck.	28 Feb.	11½	Brentford Consolidated	100	217–222	..	5 3 7
180,000	,,	,,	8½	Do. New	100	165–170	..	5 0 0
220,000	Stck.	15 Mar.	11½	Brighton & Hove Original	100	205–215	..	5 6 11
888,500	Stck.	28 Feb.	5	Bristol	100	107–110	+1	4 10 11
320,000	20	29 Mar.	11½	British	20	45–47	..	4 15 10
50,000	10	28 Feb.	11½	Bromley, Ordinary 10 p. c.	10	21–22	..	5 4 7
51,510	10	,,	8½	Do. 7 p. c.	10	15½–16½	..	5 3 0
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	6–7	..	2 17 2
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	101–104	+1	5 15 5
150,000	20	28 Feb.	8	Cagliari, Limited	20	26–27	..	5 18 6
550,000	Stck.	12 Apl.	12½	Commercial, Old Stock	100	250–255*	..	4 18 0
165,000	,,	,,	9½	Do. New do.	100	190–195*	..	4 17 5
160,762	,,	14 Dec.	4½	Do. 4½ p. c. Deb. do.	100	132–137	..	3 5 8
800,000	Stck.	14 Dec.	13	Continental Union, Limited	100	232–237	..	5 9 8
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	204–209	..	5 15 8
535,000	Stck.	28 Feb.	5	Crystal Palace Ord. 5 p.c. Stk	100	105–110	..	4 10 11
486,090	10	31 Jan.	10	European, Limited	10	22–23	..	4 6 11
354,060	10	,,	10	Do. Partly paid	7½	15½–16½	..	4 10 11
5,646,590	Stck.	14 Feb.	12	Gaslight & Coke, A, Ordinary	100	228–233	−2	5 3 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	98–102	..	3 18 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	273–278	..	3 12 0
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130–135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	190–195	..	3 16 11
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	175–180	..	3 17 9
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	270–275	..	3 12 9
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	163–168	..	3 11 5
1,061,150	,,	14 Dec.	4	Do. 4 p. c. Deb. Stk.	100	127–130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	132–137	+2	3 5 8
908,000	,,	,,	6	Do. 6 p. c. do	100	177–182	..	3 5 11
3,800,000	Stck.	15 Nov.	12	Imperial Continental	100	220–225	..	5 6 8
75,000	5	14 Dec.	6	Malta & Mediterranean, Ltd.	5	4½–5	..	6 0 0
560,000	100	2 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	108–110	..	4 10 11
541,920	20	15 Nov.	5	Monte Video, Limited	20	13½–14½	..	6 18 0
150,000	5	30 Nov.	8	Oriental, Limited	5	5¾–6¼	−¼	6 8 0
60,000	5	29 Mar.	7	Ottoman, Limited	5	3¾–4¼	..	7 7 4
166,870	10	31 Jan.	2	Pará Limited	10	2–2½	..	8 0 0
420,000	100	2 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.	100	103–109	..	5 10 1
500,000	100	1 Dec.	6	2nd Do.	100	97–102	..	5 17 8
150,000	10	13 Oct.	5	San Paulo, Limited	10	9–10	..	5 0 0
500,000	Stck.	28 Feb.	15½	South Metropolitan, A Stock	100	315–320	..	4 16 11
1,350,000	,,	,,	12	Do. B do.	100	253–258	..	4 13 0
260,000	,,	,,	13	Do. C do.	100	260–265	..	4 18 1
750,000	,,	17 Jan.	5	Do. 5 p. c. Deb. Stk.	100	153–157	+1½	3 3 8
60,000	Stck.	28 Feb.	11½	Tottenham & Edm'nton, "A"	100	210–215	..	5 7 0
				WATER COMPANIES.				
745,967	Stck.	29 Dec.	10	Chelsea, Ordinary	100	273–278	+1	3 12 0
1,720,252	Stck.	12 Apl.	8	East London, Ordinary	100	216–221*	+1	3 12 5
544,440	,,	29 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	147–150	..	3 0 0
700,000	50	14 Dec.	8½	Grand Junction	50	113–117	..	3 12 6
708,000	Stck.	28 Feb.	11½	Kent	100	288–293	..	3 18 6
1,043,800	100	29 Dec.	9½	Lambeth, 10 p. c. max.	100	248–253	..	3 15 1
406,200	100	,,	7½	Do. 7½ p. c. max.	100	200–205	..	3 13 2
310,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk.	100	132–135	..	2 19 3
500,000	100	14 Feb.	12½	New River, New Shares	100	365–370	..	3 5 0
1,000,000	Stck.	31 Jan.	4	Do. 4 p. c. Deb. Stk	100	133–136	..	2 18 10
902,300	Stck.	14 Dec.	6	S'thwk & V xoall, 10 p. c. max.	100	157–162	..	3 14 1
126,500	100	,,	6	Do. D 7½ p. c. do.	100	147–152	..	3 19 0
1,155,066	Stck.	14 Dec.	10	West Middlesex	100	265–270	..	3 14 1

*Ex div.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

HYDRAULIC AND GAS ENGINEERS, BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

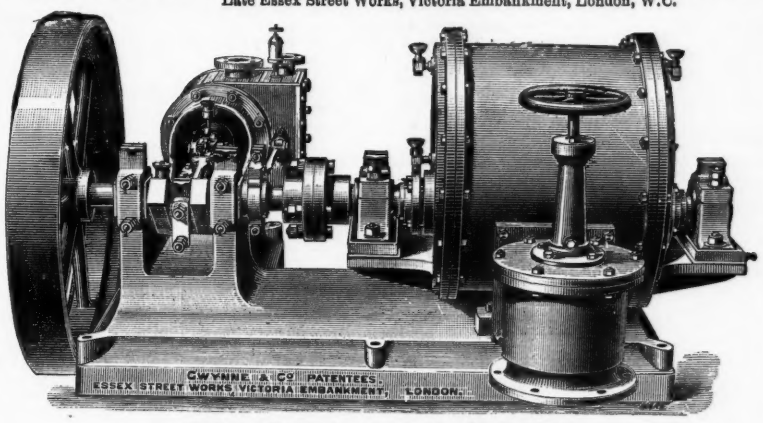
Late Essex Street Works, Victoria Embankment, London, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD nd other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent. All communications *re* OXIDE to be addressed to PALMERSTON BUILDINGS, E.C.

BRIN'S Oxygen Company, Limited, Westminster. ANDREW STEPHENSON, Agent.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 200 British Gas-Works. [See Advt., p. 678.]
ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C. Telegrams: "Volcanism, London."

LIQUOR, Tar, and Spent Oxide wanted. BROTHERTON AND CO., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and adroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

CHARTERING, FORWARDING, AND INSURANCE.

ROBERT BRUCE FITZMAURICE, 29, Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See last week, p. 688.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

JAMES LAWRIE & Co. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. II, centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, Chartered Patent Agent, Fel. Inst. Ch. Pat. Agents, Mem. Inst. Mech. Engineers, ADVISES IN ALL MATTERS relating to PATENTS FOR INVENTIONS, TRADE MARKS, &c. Handbook gratis on application.
70, CHANCERY LANE, LONDON, W.C.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.
GAS PLANT CEMENT FOR ALL LEAKAGES.

HYDRATED OXIDE OF IRON

PREPARED from pure Ir
Two or three times as rich
Strong action on Sulphur
To be used alone, but w
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Apply, by letter,
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IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

ALWAYS a Buyer of Spent Oxide, Tar, and AMMONIACAL LIQUOR.
Apply to J. HARDMAN, Milton, STAFFORDSHIRE.

WATER-WORKS Manager seeks Appointment—Engineering and Clerical. Age 34. First-class references.
Address No. 2367, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Small Village Gas-Works, a steady Man. Must be used to Iron Retorts. No Public Lamps. No House, but small Garden. Permanent situation if suitable.
Apply, stating wages required, to C. W. GRIMWOOD, Sudbury, SUFFOLK.

WANTED, a good Meter Repairer, accustomed to both Wets and Drys. One who could prove preferred. To a first-class Man (no other need apply), good wages will be paid, with a permanent situation.
Apply, by letter, to No. 2374, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ree Travellers

GAS TAR.

THE Advertiser is open to purchase this from Gas-Works (within 100 miles of London) which do not use Petroleum Oil to enrich their Gas.
Address HILLDROP, Bulwer Road, LEYTONSTONE, E.

FOR SALE—A new 25,000 ft. Telescopic GASHOLDER and TANK. Delivered and erected in any part of England.
BAKER, 2, Commercial Buildings, LEEDS.

FOR SALE—A 12-horse power Horizon-tal ENGINE, in splendid condition. A Brass vertical CYLINDER, 3 ft. high by 12 in., with Piston, Guide-Bar, and Connecting-Rod. A four-throw CENTRE-VALVE for Purifiers. Four single-acting WATER-PUMPS, with two three-throw Cranks. A FORCE PUMP. A TRAVELLING CRAB. A BOILER, 4 ft. high, 3 ft. diameter, on wheels. All from Gas-Works. Also an egg-end BOILER, 30 ft. by 6 ft.; and one Ditto, 40 ft. by 5 ft. 6 in., suitable for Tanks.
ANDREWS AND BABY, East Moors, CARDIFF.

LUDLOW GAS COMPANY.

TENDERS FOR TAR.

THE Directors of the Ludlow Gas Com-pany invite TENDERS for the surplus TAR produced at their Works.
Tenders to be sent in by the 1st of May.
The highest or any tender will not necessarily be accepted.

JAMES ELLIOTT,
Manager.

SLOUGH GAS AND COKE COMPANY.

THE Directors are prepared to receive TENDERS for a new 7-HORSE POWER EGG BOILER. Also a new or second-hand WASHER (Good's preferred).
Specifications may be seen on application to Mr. T. Webb, the Manager at the Works, Slough.
Tenders, addressed to the Chairman, R. Martin, Esq., Castleview, Chalvey, near Slough, endorsed "Tender for Boiler," or "Washer," to be delivered on or before Tuesday, the 8th prox.
The Directors do not bind themselves to accept the lowest or any tender.

ARTHUR THOMAS,
Secretary.

April 11, 1894.

ULVERSTON LOCAL BOARD.

TO TAR DISTILLERS.

THE Gas and Water Committee invite TENDERS for the purchase of the surplus TAR produced at their Works during the Year commencing the 1st of July next.
Further Particulars and Forms of Tender may be had on application to the undersigned.
Sealed tenders to be sent in not later than the 26th inst., addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Tar."
The Committee do not bind themselves to accept the highest or any tender.

JNO. SWAN,
Engineer and Manager.

ULVERSTON LOCAL BOARD.

TENDERS FOR COAL AND CANNEL.

THE Gas and Water Committee invite TENDERS for the supply of best screened GAS COAL, NUTS, and CANNEL, for One, Two, or Three Years, commencing the 1st of July next.
Parties tendering must give full particulars of the Coal and Cannel they propose to supply, and name the Pit from which the same will be raised.
Further Information and Forms of Tender may be obtained on application to the undersigned.
Sealed tenders to be sent in not later than the 26th inst., addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal" or "Cannel."
The Committee do not bind themselves to accept the lowest or any tender.

JNO. SWAN,
Engineer and Manager.

WIRKSWORTH GASLIGHT AND COKE COMPANY, LIMITED.

TAR AND LIQUOR CONTRACT.

THE Directors of the above Company are open to receive TENDERS for TAR and LIQUOR, made at their Works during the Year dating from the 1st day of May, 1894, to April 30, 1895.
Probable Quantity: Tar, 50 tons; Liquor, 75 tons; the same will be delivered in Buyer's Tanks at the Wirksworth (Midland) Railway Station.
Sealed tenders, endorsed "Tender for Tar," or "Liquor," to be sent to R. Wall, Esq., the Chairman, on or before May 7, 1894.
The Directors do not bind themselves to accept the highest or any tender.

JAMES LEE,
Manager.

COCKERMOUTH LOCAL BOARD.

(GAS DEPARTMENT.)

TENDERS are invited for the following:
Set of four 10-feet PURIFIERS, with Centre-Valve and all necessary Connections, &c.
The supply and erection of a complete SULPHATE OF AMMONIA PLANT.
Drawings and Specifications may be seen on application to the undersigned.
Endorsed tenders to be delivered at the Gas-Works not later than the 1st of May next.
The Committee do not bind themselves to accept the lowest or any tender.

ER W. SMITH,
Gas Manager.

ASHFORD, KENT.

THE Directors of the Ashford Gas and Coke Company, Limited, are prepared to receive TENDERS for the supply of 3500 tons of GAS COALS and 3500 gallons of GAS OIL, to be delivered at their Works, Ashford (Kent), in equal monthly quantities, from the 1st of July next to the 30th of April, 1895.
Tenders, specifying the description of Coals, the pits at which they are raised, the quality of the Oil, and terms for net monthly payments, to be sent to me on or before Thursday, May 3, endorsed "Tenders for Coals and Oil."

F. HUGHES HALLETT,
Secretary.

Ashford, April 11, 1894.

TENDERS FOR GAS COAL, ETC.

THE Directors of the Oakengates and St. George's Gas Company invite TENDERS for the supply of 1600 tons of the best screened GAS COAL, delivered free at the Oakengates Station, in such quantities as may be required between June 30, 1894, and June 30, 1895.
Tenders, endorsed and accompanied by an Analysis of the Coal offered, to be sent to the Manager, on or before May 16, 1894.
TENDERS also required for the supply of LIME, and the purchase of TAR and AMMONIACAL LIQUOR for One Year.
The Directors do not bind themselves to accept any tender.

GEO. PARKER,
Manager.

April 20, 1894.

THE Directors of the Market Har-borough Gas Company invite TENDERS for:—
2200 tons of Screened GAS COAL.
100 tons of LIME.
26 tons of SULPHURIC ACID.
Further information as to delivery may be obtained at the Works.
Sealed tenders, giving price per ton at Market Harborough Station, to be endorsed "Tender," and sent to the Chairman of the Company, Mr. William Gilbert, on or before the 9th of May next.
No pledge is given to accept the lowest or any tender.

CHAS. BURGOINE,
Secretary.

April 17, 1894.

MALVERN LOCAL BOARD.

TENDERS FOR GAS COAL AND CANNEL.

THE Malvern Local Board invite TENDERS for the supply of 2000 tons of best double screened SILKSTONE GAS COAL, and 500 tons of best CANNEL, to be delivered and stacked at the Gas-Works, Great Malvern, in such quantities as may from time to time be required, before the 31st of August next.
Tenders, endorsed "Tender for Gas Coal," to be sent to me on or before Saturday, the 5th prox.

WM. LAMBERT,
Clerk to the Board.

Local Board Offices, Malvern,
April 16, 1894.

BELPER GAS AND COKE COMPANY.

TENDERS FOR COAL AND COKE.

THE Directors are prepared to receive TENDERS for the supply at their Works, situate near the Railway Station, Belper, of 2000 tons more or less of GAS COAL (part in the Gas Company's own Waggons), also about 200 tons more or less of CANNEL COAL, to be delivered at such times, and in such quantities, as the Directors or their authorized Servants shall from time to time order.
Sealed tenders, stating price per ton of 21 cwt., and information as to the quality and quantity of Gas the Coal is estimated to produce, also as to where the same is now in use, to be sent to the undersigned, on or before Friday, the 4th of May.
The Directors do not bind themselves to accept the lowest or any tender, nor to take the whole of the above quantities of Coal or Cannel.

By order,
JOSEPH PYM,
Managing-Director.

Belper, April 16, 1894.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

TICE is Hereby Given, that the NARY HALF-YEARLY GENERAL Shareholders of the above Company ffices of the Company, 30, Grace- of London, on Tuesday, the hree o'clock in the Afternoon Directors' Report and the the Half Year ended the declare a Dividend, to in place of those retiring General Business of osed from the 1st to e.
Board,
AMUEL WOOD,
Secretary.
ondon,

CARDIFF GASLIGHT AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company are prepared to receive TENDERS for a supply of 45,000 tons of best, well-screened, large GAS COAL, to be delivered between July, 1894, and the 30th of June, 1895, in monthly quantities in accordance with the Specification.
Parties tendering may do so for the whole quantity or for quantities from 5000 tons upwards.
Forms of Tender and Specification of monthly deliveries may be obtained on application to Mr. H. Morley, the Company's Engineer.
Sealed tenders to be sent to the undersigned not later than Thursday, the 3rd day of May next, addressed to the Chairman of the Company, and endorsed "Tender for Coal."
The Directors do not bind themselves to accept the lowest or any tender, and reserve to themselves the right to apportion the whole quantity as they may think fit.

By order,
GEORGE CLARRY,
Secretary.

Gas Offices, Cardiff,
April 11, 1894.

BARNET DISTRICT GAS & WATER COMPANY.

SALE BY TENDER OF
£5000 "D" GAS STOCK, IN 50 LOTS OF £100 EACH.

IN Pursuance of the Barnet District Gas and Water Act, 1883, notice is hereby given that it is the intention of the Directors to SELL BY TENDER £5000 "D" GAS STOCK of the Company; such Stock being the first portion of "D" Gas Capital authorized to be raised by the said Act, and sanctioned by a Resolution passed at an Extraordinary Meeting of the Proprietors held on the 22nd day of February, 1884.
The Dividend on the Stock will accrue from the 30th of June, 1894, and will be calculated half-yearly up to the 31st day of December, 1894; and thereafter up to the 30th day of June and the 31st day of December in each following year, and will be paid, by Cheque or Dividend Warrant, simultaneously with the payment of the Dividends on the other Capital of the Company, after the Half-Yearly Meetings held in August and February in each year.
A Deposit of 10 per cent. of the total price offered for the Lot or Lots tendered for must accompany each tender.
A Reserve Price will be put upon the Stock (which will not be less than the nominal amount thereof), and notice of such Reserve Price will be sent by the Company (in a sealed letter) to the Board of Trade in due time before the last day for the reception of tenders.
Particulars and Conditions of Tender may be obtained on application to this Office; and sealed tenders must be sent in not later than Twelve o'clock (noon) on Friday, the 11th day of May, 1894.

By order of the Board,
ALFRED LAGG,
Secretary.

Offices of the Company:
30, Gracechurch Street, London,
April 16, 1894.

Just published.
With numerous Illustrations and Tables, crown 8vo. cloth, 6s.
THE
GAS ENGINEER'S LABORATORY HANDBOOK,
By JOHN HORNBY, F.I.C.
Honours Medallist in Gas Manufacture, City and Guilds of London Institute.
LONDON: E. & F. N. SPON, 125, Strand.
NEW YORK: 12, Cortlandt Street.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly
600,000 Tons per Annum.
Full particulars on application to
MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·68 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE:
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

11, BAY STREET, PORT GLASGOW.

Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,
FITTER.

T.B.KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T.B.KITTEL, SHEFFIELD.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cubic feet.
Illuminating Power	16·4 candles.
Coke	68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
B Lombard Street,
NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

Price 21s., Post Free,

PRECEDENTS IN PRIVATE BILL LEGISLATION

AFFECTING GAS AND WATER UNDERTAKINGS, 1879-90.

Compiled by E. H. STEVENSON & E. K. BURSTAL.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

HARPER & MOORES,

STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.

Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1836.

GAS AND WATER PIPES.

Telegraphic Address: "RITCHIE MIDDLESBROUGH."

TROTTER, HAINES, & CORBETT,
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FIRE-CLAY & BRICK WORKS,
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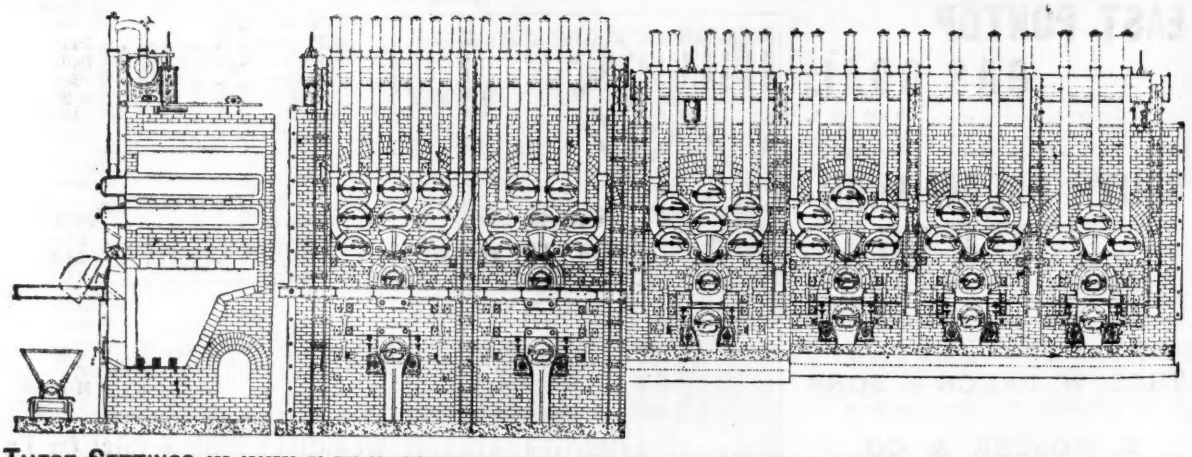
HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE ADAPTED TO THE REQUIREMENTS OF ALL GAS COMPANIES AND GAS CORPORATIONS, AND HAVE ALREADY BEEN VERY EXTENSIVELY ADOPTED. THEY ARE ERECTED UPON BOTH THE WORKING-STAGE AND SHALLOW-CHAMBER SYSTEMS, AND EQUALLY SATISFACTORY RESULTS ARE GUARANTEED IN BOTH CASES.
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Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings; or complete erection undertaken if required, and carried out by specially Trained Workmen.

Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stuart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge; JOHN WALSH & SONS, Retort Builders, Halifax, Yorkshire; RICHARD TURNER, Retort Builder, Denton, Lancashire; and from the Principal Agent, R. F. HISLOP (son of Patentee), Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine quâ non* TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED, AND AFFORDING THE HIGHEST SATISFACTION.

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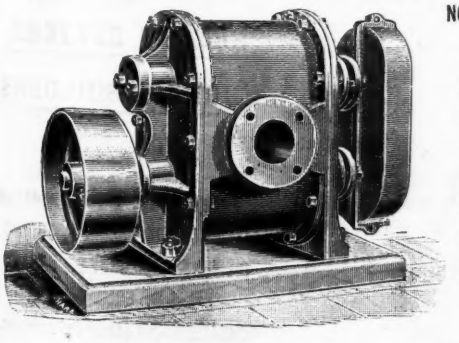

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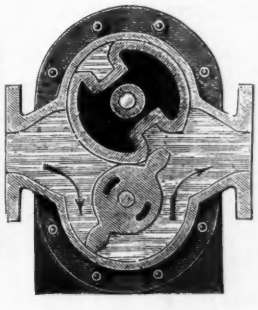

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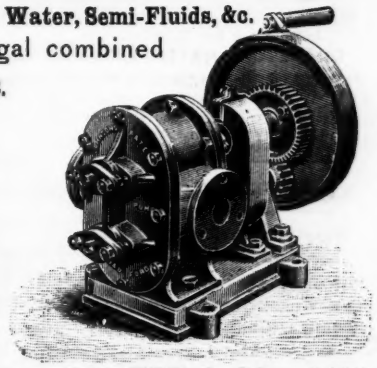

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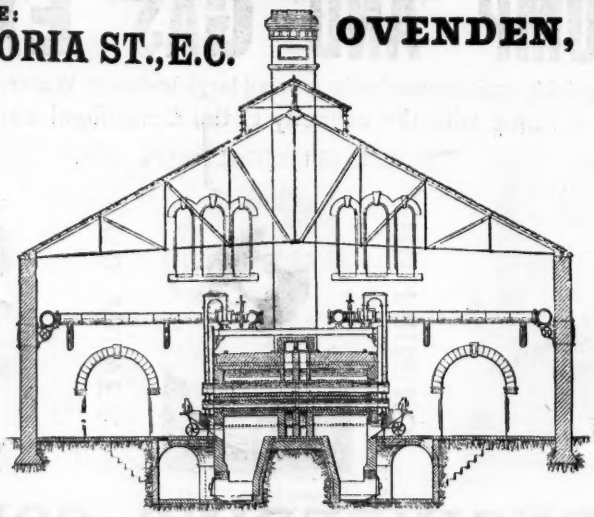

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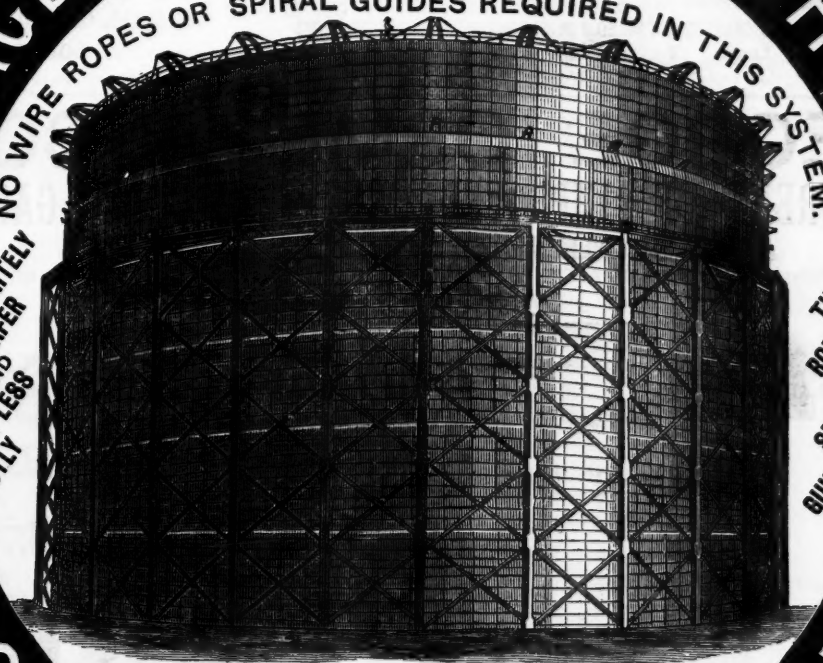

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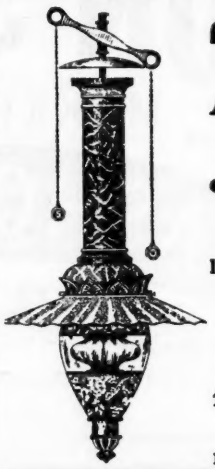

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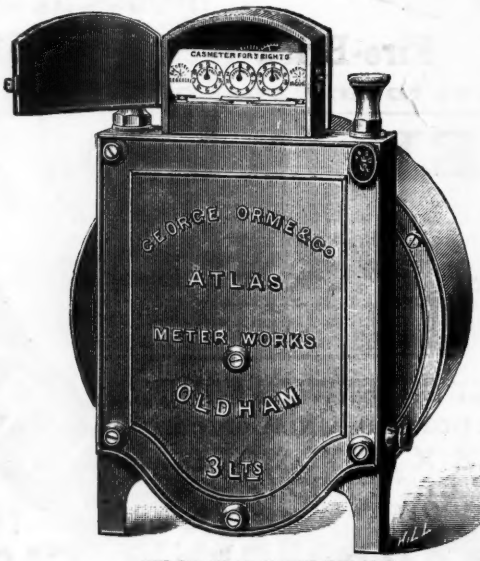

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